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AN EVALUATION OF THE IMPACT OF DISCRIMINATORY TAXATION ON THE USE OF PRIMARY AND SECONDARY RAW MATERIALS

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This report attempts to describe and quantify the value of current Federal tax policy as it relates to competition between virgin and secondary materials. Tax incentives are quantified on a per ton basis both at the raw material and selected final product stages. A qualitative review of the potential impact of removing virgin material incentives on the use of secondary materials is provided. Seven materials are included (bauxite, timber, sand, iron ore, coal, oil, natural gas) with an analysis of how their taxes impact on several product categories (glass, steel, aluminum, newsprint, paperboard, plastics and rubber). The tax benefits examined include the depletion allowance, capital gains, exploration and development expenditures, State and local taxes and foreign taxes.

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SUMMARY

This is a summary which presents findings and conclusions developed at length in the body of this report.

1. THE PRIMARY PURPOSE OF THIS STUDY HAS BEEN TO IDENTIFY DISCRIMININATORY TAX TREATMENT AND ESTIMATE ITS IMPACT ON RAW MATERIALS COSTS IN SIX INDUSTRIES

The primary purpose of this study has been to identify taxes and tax shelters applicable on a discriminatory basis to virgin or secondary raw materials and to estimate their impacts on raw materials costs for the following industries:

- Aluminum
- Pulp and Paper
- Glass
- Steel
- Plastics
- Rubber

As a secondary study objective, an attempt has been made to assess, on a qualitative basis, the extent to which discriminatory taxation may influence relative virgin and secondary materials use in the commodities of interest.

2. DISCRIMINATORY TAXES AND TAX BENEFITS WERE IDENTIFIED

For purposes of this study, discriminatory taxes and tax benefits were defined as those which are incident to the use of either virgin or secondary raw materials but not to both. It should be clearly understood that the term "discriminatory" in this context implies no judgment as to the equity or utility of specific taxes or tax benefits but merely relates to their incidence.

AN EVALUATION OF THE IMPACT OF DISCRIMINATORY TAXATION ON THE USE OF PRIMARY AND SECONDARY RAW MATERIALS

Final Report

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The taxes and tax benefits identified as discriminatory were all found to be applicable to virgin raw materials. No taxes or tax benefits were identified as applicable to secondary materials but not to virgin materials.

Exhibit I, following this page, summarizes the major discriminatory taxes and tax benefits identified and evaluated during the study. Each of the elements of taxation shown are governed by complex definitions and limitations which are discussed in some detail in Chapter II of this report. The applicability of the taxes and tax incentives to the commodities of interest in the study and to the raw materials required to produce them is indicated on Exhibit II. The relative importance of individual tax elements as they relate to specific commodities and raw materials is discussed in following sections of this Summary.

3. EQUIVALENT PRIMARY AND SECONDARY RAW MATERIALS WERE IDENTIFIED

Virgin raw materials and substitute secondary raw materials consumed in the manufacture of the six commodities of interest were identified. Production processes related to both primary and secondary raw materials use were identified for each commodity of interest and relative raw material input and output ratios were developed to provide a basis for estimating the dollar impact of discriminatory tax treatment on an equivalent product basis. Specific attention was given to the impact of technology on primary and secondary material substitutability.

The equivalent primary and secondary products selected for evaluation are shown on Exhibit III. As indicated in the Comments column of the Exhibit, in most cases perfect substitutability does not exist. Both process and product characteristics operate to limit substitutability. In plastics, for example, substitutability of secondary materials is virtually zero using currently available technology. For the other commodities, the substitutability of secondary materials varies quite widely. This subject is touched upon in more detail in following sections of this Summary.

4. THE IMPACT OF DISCRIMINATORY TAXATION ON VIRGIN RAW MATERIALS COSTS WAS COMPUTED

Data required to estimate the impact of discriminatory taxes and tax benefits on virgin raw materials costs were identified along with

EXHIBIT I

SUMMARY OF MAJOR DISCRIMINATORY TAXES AND TAX BENEFITS

Tax/Tax Benefit	Effect on Income	Measure of Impact	Applicability
The Percentage Depletion Allowance	Reduces Federal Income Taxes payable	The amount of the reduction in Federal Income Tax payable if percentage depletion is elected in preference to cost depletion	Applicable to U. S. and foreign mineral extraction by companies taxable in the U. S.
Foreign Tax Credit	Reduces Federal Income Taxes payable	The amount of the reduction in Federal Income tax payable if taxes paid to foreign governments are treated as credits against income taxes payable rather than deductions to taxable income.	Applicable to the foreign taxes paid by corporations subject to the U. S. Income Tax.
Expensing of Mine Exploration and Development Expenditures	Defers Federal Income Taxes payable	The present value of the amount of Federal Income Tax payments deferred to future years if subject expenditures are treated as current year expenses in preference to capitalization and amortization over several years.	Applicable to mining operations of companies taxable in the U. S. Not applicable to petroleum production.
Expensing of Intangible Drilling and Development Costs	Defers Federal Income Taxes payable	The present value of the amount of Federal Income Tax payments deferred to future years if the subject expenditures are treated as current year expenses in preference to capitalization and amortization over several years.	Applicable to petroleum and natural gas drilling operations of companies subject to the U. S. Income Tax
Capital Gains Treatment of Income from Timber Sales	Reduces Federal Income Taxes payable	The amount of the reduction in Federal Taxes payable if income from sales of harvested timber treated as capital gains as opposed to ordinary income	Applicable to timber harvesting operations in the U. S.
Minimum Tax on Tax Preferences	Increases Federal Income Taxes payable	The amount of the limitation on the reduction in Federal Income Taxes payable which can be obtained by use of "tax preference" items such as percentage depletion or capital gains	Applicable to taxable entities using "tax preference" items
State and Local Resource Taxes	Increases total taxes payable	The amount of the resources taxes payable	Applicable in some locations to mining, drilling and timber operations.

EXHIBIT II

INCIDENCE OF SIGNIFICANT DISCRIMINATORY TAXES AND TAX BENEFITS FOR THE COMMODITIES OF INTEREST

	Aluminum	Pulp & Paper	Glass			Steel			Plastics & Rubber	
Tax/Tax Benefit	Bauxite	Timber	Sand	Lime-stone	Feld spar	Iron Ore	Coal	Lime-stone	Petroleum	Natural Gas
Percentage Depletion	X	-	X	X	X	X	X	X	X	X
Foreign Tax Credit	X	X	-	-	-	X	X	-	X	X
Expensing of Mine Exploration and Development Expenditures	X	-	X	X	X	X	X	X	-	-
Expensing of Intangible Drilling and Development Costs	-	-	-	-	-	-	-	-	X	X
Capital Gains Treatment of Income from Timber Sales	-	X	-	-	-	-	-	-	-	-
Minimum Tax on Tax Preferences	X	X	X	X	X	X	X	X	X	X
State and Local Resources Taxes	X	X	X	X	X	X	X	X	X	X

EXHIBIT III

EQUIVALENT PRIMARY AND SECONDARY PRODUCTS SELECTED FOR EVALUATION

Commodity	Primary Product	Equivalent Secondary Product	Comments
Aluminum	Primary Aluminum Ingot	Secondary Aluminum Ingot	Substitutability exists primarily in ingot for making aluminum castings
Pulp and Paper	Primary Newsprint Primary Paperboard	Secondary Newsprint Secondary Paperboard	Secondary newsprint may be freely substituted for primary newsprint in end uses.
			Secondary and primary paperboard while substitutable in many applications, often have differing appearance and strength characteristics which affect market acceptance.
			Production of most products using a mix of primary and secondary materials is possible, subject to limitations on the proportion of secondary materials. Limits vary from product to product.
Glass	Primary Bottle Quality Glass	Secondary Bottle Quality Glass	Secondary glass (cullet) may be freely substituted for virgin materials for up to 100% of product content if cullet is of the same grade and color as the glass to be produced.
Steel	Raw steel	Raw steel	In most cases, raw steel made from scrap is fully substitutable for raw steel made from virgin materials.
			There are process limitations on the proportion of scrap which may be used in the manufacture of steel.
Plastics	Thermoplastics--Polyethelene, PVC, Polystyrene	None	Thermoplastics are not recycled due to problems of separating and matching specific waste plastics for use in making like formula products
	Thermosetting plastics	None	Thermosetting plastics cannot be recycled using existing technology
Rubber	SBR (Synthetic Rubber)	Reclaimed Rubber	The proportion of reclaimed rubber which can be used in tires (the principal rubber product) is limited by product performance specifications.

potential data sources. The primary published data sources used included producer financial statements, SEC filings, IRS publications and records, as well as special tax studies, Congressional hearing records, and industry association records. In general, the major shortcomings of published data from all sources proved to be lack of specificity and inadequate disaggregation. To obtain data not publicly available, major producers of the commodities of interest were contacted directly or through their trade associations and requested to provide data with the stipulation that any information considered to be proprietary would be treated so that the source would not be disclosed to any parties other than the Booz, Allen & Hamilton staff.

The level of producer cooperation varied from company to company and within industries. The primary reasons advanced for limiting cooperation by those contacted were company policy regarding disclosure, the applicability of data to ongoing litigation, the cost of putting data in a usable form, and misgivings concerning potential Government use of the data.

Due to limitations inherent in the data base for the reasons discussed above, it was necessary to develop impact estimates in spite of data gaps. Accordingly, a methodology was used which, in the absence of contrary data, produced estimates of maximum impacts. Thus, the impact estimates developed during the study are weighted against understating the effect of discriminatory taxes and tax benefits on virgin raw materials costs. A detailed explanation of the estimating procedures used for each commodity studied is provided in the individual commodity chapters of this report (Chapters III - VII).

Estimates were prepared for the years 1970 through 1972 for all virgin raw materials except petroleum and natural gas used in the production of rubber and plastics. The 1970-1972 period reflects the operation of current rules governing the tax elements evaluated. In the case of petroleum and natural gas, estimates for the years 1969 through 1971 were prepared to make use of specific data elements available for those years which were not available for 1972 at the time the study was conducted.

Exhibit IV, following this page, shows the estimated impacts of discriminatory taxes and tax benefits on the unit cost of producing primary aluminum, newsprint, paperboard, glass, steel and petroleum and natural gas. The estimates shown are for 1972 with the exception of petroleum and natural gas for which 1971 estimates are provided. Unlike the other commodities indicated, petroleum and

EXHIBIT I

MAXIMUM ESTIMATED IMPACT OF DISCRIMINATORY TAXES AND TAX BENEFITS ON THE COST OF SELECTED COMMODITIES - 1972

Tax Element	Aluminum ($ Per Ingot Ton)	Pulp & Paper		Glass ($ Per Ton)	Steel ($ Per Ton of Raw Steel)	Petroleum ($ per BBL) For 1971	Natural Gas ($ per MCF) For 1971
		Newsprint ($ Per Ton)	Paperboard ($ Per Ton)				
Percentage Depletion	$1.35	$ -	$ -	$0.20	$0.90	$0.25	$0.015
Foreign Tax Treatment	1.51	-	-	-	0.27	0.13	-
Expensing of Mine Exploration & Development Expenditures	1.02	-	-	-	0.27	-	-
Expensing of Intangible Drilling & Development Costs	-	-	-	-	-	0.01	0.002
Capital Gains Treatment of Income From Timber Sales	-	1.14	2.48	-	-	-	-
Minimum Tax on Preferences	-	-	-	-	-	(0.04)	(0.002)
State and Local Resources Taxes	(0.08)	-	-	-	(0.19)	(0.06)	(0.007)
Total (After Tax)	$3.80	$1.14	$2.48	$0.20**	$1.25	$0.29	$0.008
% of Price	0.7	0.7	1.4 - 2.2	1.4	1.7*	9.8	4.4
Total (Before Tax)	$7.92	$2.28	$4.96	$0.40	$2.60	$0.60	$0.017
% of Price	1.5	1.4	2.8 - 4.3	2.7	3.5*	20.2	9.3

* Percent of estimated average cost of producing raw steel @ $75.00 (ton)

** Includes estimated percentage depletion for limestone, soda ash (a limestone derivative) and feldspar

Note: Impacts are shown as tax savings associated with tax benefits (after tax basis). Before tax impacts represent the amount that prices would have to be increased to fully affect the effects of the removal of tax benefits.

natural gas are raw materials used in making plastics and rubber. As is explained in Chapter VII, the procedures for estimating the tax element impacts on the cost of producing plastics and rubber differed somewhat from those used for estimating impacts for other commodities. Accordingly, a detailed impact estimate for each tax element was not prepared for plastics and rubber. Estimated total impacts of discriminatory taxes and tax benefits on the cost producing selected plastic products and rubber for 1971 are summarized on Exhibit V, following this page.

Estimates for specific tax elements as they relate to specific commodities were not prepared in those cases where:

- The tax element would not be applicable (e.g., percentage depletion does not apply to timber operations)
- The tax element would not produce a significant impact

Because of the data limitations discussed above, the figures shown on Exhibits IV and V represent order of magnitude estimates. They are, however, sufficiently accurate to permit a general assessment of their significance in terms of relative virgin versus secondary raw materials usage.

5. DISCRIMINATORY TAXES AND TAX BENEFITS ARE LIKELY TO HAVE SOME MARGINAL IMPACT ON RELATIVE RAW MATERIALS USE IN PRODUCING THE COMMODITIES OF INTEREST

It can be stated conceptually that any measures to provide tax treatment equalization to virgin and secondary materials would cause the relative cost of using secondary materials to decrease at all levels of use. Accordingly, tax treatment equalization should produce some increase in relative secondary materials use.

The degree to which secondary materials use will increase will depend upon the amount of the change in relative cost as it relates to

EXHIBIT V

ESTIMATED IMPACT OF DISCRIMINATORY TAXES AND TAX BENEFITS ON THE COST OF PRODUCING SELECTED PLASTIC AND RUBBER PRODUCTS - 1971

($ PER POUND)

	LOW				HIGH			
	After Tax		Before Tax		After Tax		Before Tax	
Products	$	% of Price	$	% of Price	$	% of Price	$	% of Price
High Density Polyethelene	0.0004	0.27	0.0008	0.54	0.0007	0.52	0.0014	1.04
Low Density Polyethelene	0.0002	0.16	0.0004	0.32	0.0006	0.47	0.0012	0.54
Polyvinyl Chloride	N/A	N/A	N/A	N/A	0.0003	0.23	0.0006	0.46
Polystyrene	0.0004	0.25	0.0008	0.50	0.0009	0.72	0.0018	1.42
SBR (Synthetic Rubber)	0.0007	0.2	0.0014	0.4	0.0017	0.7	0.0034	1.4

Note: Impacts are shown as tax savings associated with tax benefits (after tax basis). Before tax impacts represent the amount that prices would have to be increased to fully offset the effects of the removal of tax benefits.

the marginal cost of accessing and using additional secondary materials. Estimating the marginal cost of secondary materials is beyond the scope of this study; however, the following points can be made:

- The price behavior of the secondary materials used to produce the commodities of interest (except plastics where secondary materials are not used) suggests that the marginal costs of bringing additional supplies into the market place are high in the short run.

- The long run marginal costs of the secondary materials of interest are not known; however, it appears likely that a not insignificant cost component relates to the market risk inherent in developing secondary materials supplies which is in turn a function of price volitility. A potential means of dealing with such costs is through the development of municipal reclamation centers which could absorb market price fluctuations. This could prove feasible particularly in areas where such a scheme would provide cost advantages over other means of waste disposal.

- That the long run marginal cost of obtaining additional secondary materials may be relatively high is suggested by the fact that for all of the commodities studied, significant increments to the market supply of secondary materials must be developed from the post consumer waste stream which is the highest cost source of secondary materials due to the mixed character of the waste and the attendant separation problems and the relatively dispersed nature of the sources which imposes higher transportation costs. As above, the use of municipal reclamation centers may provide a means of adjusting costs, if the costs of alternative disposal techniques are built into the equation. At the present time, such cost offsets are not reflected in the marketplace.

- In the short run, limits to the use of secondary materials are imposed by the characteristics of manufacturing technology in use. In the long run, technological change and the development of new manufacturing capacity capable of using secondary materials could significantly reduce these barriers.

- In general, the use of secondary materials requires less energy than does the use of primary materials. The manufacturing capacity to produce equivalent output also requires less capital investment in many cases, particularly for aluminum, pulp and paper, and steel. In view of the current energy shortage and the capital squeeze faced by producers, these factors should operate in favor of increased secondary materials use over the long term.

In view of the uncertainties outlined above, no conclusive statements can be made regarding the impact of discriminatory taxation on relative raw materials use. Given the magnitude of the impacts indicated on Exhibits IV and V and the indications that the marginal cost of increased secondary materials use may be relatively high, the best that can be said is that tax treatment equalization alone may cause some marginal increase in secondary materials utilization. It should be kept in mind, however, that there are additional forces in operation which may beneficially influence secondary materials usage.

Specific commodity impacts are discussed below:

(1) Tax Treatment Equalization May Have Some Marginal Impact on Relative Use of Aluminum Scrap

The substitutability of secondary aluminum for primary aluminum is limited by the following:

- Primary and secondary ingot manufacturing processes are not compatible thus increased scrap usage will require secondary aluminum capacity expansion.

- Secondary ingot competes with primary ingot at present only in casting applications. Were secondary ingot to capture a 100% share of the casting market output could be increased up to 12.5%. Additional secondary ingot substitution would require advances in technology and changes in the alloy content of secondary ingot.

At the present time, soaring foreign aluminum prices have caused strong aluminum scrap export demand which has caused scrap prices to increase to a point where domestic producers are faced with a scrap shortage. They cannot outbid foreign producers for available supplies in the face of controlled product prices. Thus, while scrap market supplies may be increasing due to large price increases, domestic producers are faced with decreasing supplies. This situation should correct itself upon price decontrol; however, there is unlikely to be any secondary capacity expansion as long as the situation persists.

The energy crisis and the capacity squeeze faced by aluminum producers tend to auger well for secondary production increases over the long term as secondary production requires less than 10% of the energy and about 10% of the capital required for equivalent primary output.

As with other commodities, the marginal cost of aluminum scrap is not known; however, given the fact that readily accessable supplies are in use and the limitations on substitution discussed above, it appears that tax treatment equalization would have at best a marginal impact on secondary output. In the long run, the factors discussed above may lead to increased secondary output, although the degree to which such output is likely to increase cannot be estimated at this time.

(2) The Ultimate Impact Tax Treatment Equalization on Waste Paper Usage Is Indeterminate

Potential for increased use of waste paper in paper manufacturing does exist with the degree of substitution feasible varying by product. Indeed, there is evidence that some mills are increasing the proportion of waste paper in their products due to a shortage of virgin fibers related to difficulties and costs of obtaining labor for lumbering operations. The ultimate degree of substitution will, of course, depend on the marginal cost of wastepaper and the technological limits to substitution for specific products.

The above notwithstanding, history indicates that wastepaper market supplies are relatively insensitive to price in the short term indicating that an adjustment of relative wastepaper and virgin fibre costs of the order indicated on Exhibit IV would produce only marginal short term increases in secondary fibre usage.

In the long run, the impact of tax treatment equalization is indeterminate as the long run marginal cost of secondary fibre is not known. As with other waste materials, however, additional market supplies would have to be drawn from the post consumer waste stream which leads to the conclusions that such costs may be relatively high. Nevertheless, the American Paper Institute has extimated that use of old corrugated boxes, from commercial sources, may increase by as much as 34% over the next three years.

(3) Tax Treatment Equalization Is Likely to Have Only a Marginal Impact on the Relative Use of Scrap Glass

At the present time, industrial source cullet (scrap glass) is fully utilized. While cullet recovery from post consumer waste is in limited practice, the economics of collection separation and transportation are unfavorable. While precise quantitative data are not available, it appears unlikely that an adjustment in materials costs up to a maximum of $0. 40 per ton (See Exhibit IV) would be sufficient to offset such costs.

Were municipalities to absorb collection and separation costs in reclamation centers, the economics of recycling could potentially be improved.

(4) Tax Treatment Equalization May Cause Some Marginal Increase in Steel Scrap Usage

At the present time, about 18% of steel output is accounted for by electric furnaces consuming scrap. Any change in relative materials costs in favor of scrap would tend to make electric furnace production more attractive. Some limited increase in scrap utilization in other steelmaking processes may also be expected, subject to technological limitations on substitution.

The major barrier to the development of additional electric furnace capacity is the potential shortage of electrical power in both the long and the short term.

During 1973, a scrap shortage developed as export buyers outbid domestic purchasers for available supplies. This situation developed as foreign steel prices increased at a much faster rate than domestic prices which are subject to price controls. With a return to a free market, this situation should correct itself. While the domestic-foreign price imbalance exists, however, scrap for domestic producers should remain in short supply, subject, of course, to the extension of scrap export limitations. Accordingly, in the short run tax treatment equalization should have little, if any, usage impact.

In the long run, the degree to which scrap utilization increases will depend on the marginal cost of bringing additional quantities of scrap into the market place. Such costs will undoubtedly include some discounting of market risk. Definitive statements as to the effectiveness of tax treatment equalization are not possible as neither the short nor the long run marginal costs of additional scrap are known. As indicated in preceding sections, however, the establishment of mechanisms such as municipal reclamation centers, if they prove feasible can provide a means of accommodating market risk.

It should be pointed out, however, that readily accessable sources of steel scrap are currently in use thus additional market supplies will have to be drawn from higher cost sources.

(5) Tax Treatment Equalization is Unlikely to Influence the Relative Use of Secondary Materials in the Manufacture of Plastics and Rubber

Thermosetting plastics cannot be remelted and reused in any currently available process, thus tax treatment equalization should have no impact.

Thermoplastics would require sorting by grade for reuse in making plastics. Given that there are many grades and types of thermoplastics, the cost of sorting and grading from a mixed waste stream would be prohibitive. A change in relative materials costs of the order indicated on Exhibit V should not be sufficient to offset the other costs of recycling.

The use of reclaimed rubber, principally from tires has been declining for two reasons:

- Product (tire) performance specifications which limit the proportion a reclaimed rubber which can be used
- Increased costs of reclaiming rubber from old tires caused by increased use non-rubber tire components (e.g., steel and nylon belts)

Given changes in relative materials costs through tax treatment equalization of the order indicated on Exhibit V, it is unlikely that tax equalization alone would be sufficient to cause producers to consider any significant increases in their use of reclaimed rubber.

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APPENDIXES

I. INTRODUCTION

The Resource Recovery Division of the EPA, Office of Solid Waste Management is responsible for evaluating alternative means of encouraging secondary materials recovery and reuse. In connection with this responsibility, the Resource Recovery Division is examining the influence of discriminatory taxation on the relative use of virgin and secondary raw materials in the manufacturing process. The purpose of this study has been to quantify the tax impact and to assess the influence of discriminatory taxation on the relative use of virgin and secondary raw materials in the manufacture of the following products:

- Aluminum
- Pulp and Paper
- Glass
- Steel
- Plastics
- Rubber

1. THE PRIMARY STUDY OBJECTIVE HAS BEEN TO IDENTIFY DISCRIMINATORY TAX TREATMENT AND ESTIMATE ITS IMPACT ON RAW MATERIALS COSTS

The primary objective of the study has been to identify taxes and tax benefits applicable on a discriminatory basis to virgin or secondary materials use and to estimate their impacts on raw materials costs. A secondary study objective has been, on a qualitative basis, to assess the degree to which discriminatory taxation may be expected to influence the relative use of virgin and secondary raw materials in the manufacture of the six products identified above.

The major tasks completed in conducting the study were as follows:

- Identification of discriminatory elements of taxation.
- The identification and matching of virgin raw materials and their equivalent secondary materials substitutes; and the establishment of equivalent material input and output ratios.
- Identification of tax data needs and accessible data sources.
- Tax data collection and evaluation.
- Computation of tax impacts on relative materials costs.
- Assessment of the significance of tax related material cost differentials in terms of relative virgin and secondary raw materials use.

2. DISCRIMINATORY TAXES AND TAX BENEFITS WERE IDENTIFIED

Discriminatory taxes and tax benefits were identified through extensive research of Federal, state, and local tax regulations and a comprehensive review of related tax literature including specialized tax journals. The applicability of discriminatory tax elements which is summarized on Exhibit I and II, following this page, and the rules governing their application are discussed in detail in Chapter II of this report.

3. EQUIVALENT PRIMARY AND SECONDARY MATERIALS WERE IDENTIFIED

Virgin raw materials and substitute secondary raw materials consumed in the manufacture of the six products were identified. They are summarized on Exhibit III, following Exhibit II. Production processes related to both secondary and primary raw materials use were analyzed for each product of interest and relative raw materials

EXHIBIT I

SUMMARY OF MAJOR DISCRIMINATORY TAXES AND TAX BENEFITS

Tax/Tax Benefit	Effect on income	Measure of Impact	Applicability
The Percentage Depletion Allowance	Reduces Federal Income Taxes payable	The amount of the reduction in Federal Income Tax payable if percentage depletion is elected in preference to cost depletion	Applicable to U. S. and foreign mineral extraction by companies taxable in the U. S.
Foreign Tax Credit	Reduces Federal Income Taxes payable	The amount of the reduction in Federal Income tax payable if taxes paid to foreign governments are treated as credits against income taxes payable rather than deductions to taxable income.	Applicable to the foreign taxes paid by corporations subject to the U. S. Income Tax.
Expensing of Mine Exploration and Development Expenditures	Defers Federal Income Taxes payable	The present value of the amount of Federal Income Tax payments deferred to future years if subject expenditures are treated as current year expenses in preference to capitalization and amortization over several years.	Applicable to mining operations of companies taxable in the U. S. Not applicable to petroleum production.
Expensing of Intangible Drilling and Development Costs	Defers Federal Income Taxes payable	The present value of the amount of Federal Income Tax payments deferred to future years if the subject expenditures are treated as current year expenses in preference to capitalization and amortization over several years.	Applicable to petroleum and natural gas drilling operations of companies subject to the U. S. Income Tax
Capital Gains Treatment of Income from Timber Sales	Reduces Federal Income Taxes payable	The amount of the reduction in Federal Taxes payable if income from sales of harvested timber treated as capital gains as opposed to ordinary income	Applicable to timber harvesting operations in the U. S.
Minimum Tax on Tax Preferences	Increases Federal Income Taxes payable	The amount of the limitation on the reduction in Federal Income Taxes payable which can be obtained by use of "tax preference" items such as percentage depletion or capital gains	Applicable to taxable entities using "tax preference" items
State and Local Resource Taxes	Increases total taxes payable	The amount of the resources taxes payable	Applicable in some locations to mining, drilling and timber operations.

EXHIBIT II

INCIDENCE OF SIGNIFICANT DISCRIMINATORY TAXES AND TAX BENEFITS FOR THE COMMODITIES OF INTEREST

	Aluminum	Pulp & Paper	Glass			Steel			Plastics & Rubber	
Tax/Tax Benefit	Bauxite	Timber	Sand	Lime-stone	Feld spar	Iron Ore	Coal	Lime-stone	Petroleum	Natural Gas
Percentage Depletion	X	-	X	X	X	X	X	X	X	X
Foreign Tax Credit	X	X	-	-	-	X	X	-	X	X
Expensing of Mine Exploration and Development Expenditures	X	-	X	X	X	X	X	X	-	-
Expensing of Intangible Drilling and Development Costs	-	-	-	-	-	-	-	-	X	X
Capital Gains Treatment of Income from Timber Sales	-	X	-	-	-	-	-	-	-	-
Minimum Tax on Tax Preferences	X	X	X	X	X	X	X	X	X	X
State and Local Resources Taxes	X	X	X	X	X	X	X	X	X	X

EXHIBIT III

EQUIVALENT PRIMARY AND SECONDARY PRODUCTS SELECTED FOR EVALUATION

Commodity	Primary Product	Equivalent Secondary Product	Comments
Aluminum	Primary Aluminum Ingot	Secondary Aluminum Ingot	Substitutability exists primarily in ingot for making aluminum castings
Pulp and Paper	Primary Newsprint Primary Paperboard	Secondary Newsprint Secondary Paperboard	Secondary newsprint may be freely substituted for primary newsprint in end uses. Secondary and primary paperboard while substitutable in many applications, often have differing appearance and strength characteristics which affect market acceptance. Production of most products using a mix of primary and secondary materials is possible, subject to limitations on the proportion of secondary materials. Limits vary from product to product.
Glass	Primary Bottle Quality Glass	Secondary Bottle Quality Glass	Secondary glass (cullet) may be freely substituted for virgin materials for up to 100% of product content if cullet is of the same grade and color as the glass to be produced.
Steel	Raw steel	Raw steel	In most cases, raw steel made from scrap is fully substitutable for raw steel made from virgin materials. There are process limitations on the proportion of scrap which may be used in the manufacture of steel.
Plastics	Thermoplastics--Polyethelene, PVC, Polystyrene	None	Thermoplastics are not recycled due to problems of separating and matching specific waste plastics for use in making like formula products
	Thermosetting plastics	None	Thermosetting plastics cannot be recycled using existing technology
Rubber	SBR (Synthetic Rubber)	Reclaimed Rubber	The proportion of reclaimed rubber which can be used in tires (the principal rubber product) is limited by product performance specifications.

input and output ratios were developed to provide a basis for estimating the dollar impacts of discriminatory tax treatment on equivalent product costs.

In conducting this analysis specific attention was given to identifying and assessing technological and economic barriers to the substitution of secondary raw materials for virgin raw materials.

4. TAX DATA REQUIREMENTS AND SOURCES WERE IDENTIFIED AND DATA WAS COLLECTED

The data required to compute the impact of identified discriminatory taxes and tax benefits were identified along with potential data sources. Initial efforts were directed at identifying and acquiring of publically available data including:

- Producer financial statements
- SEC filings
- Internal Revenue Service publications and records
- Records of court cases
- Other sources, including Congressional hearing records, tax studies, industry tax publications, and publications of various government agencies

Useful data were obtained from producer financial statements and SEC filings, particularly for 1972 as a result of more complete information disclosure than in prior years. IRS data proved to be of limited value due to age (up to ten years out of date) and levels of aggregation. Such data proved to be useful when it was up to date and related to industries when integration and diversification are limited. Court cases provided little useful data as available decisions were in settlement of litigation regarding tax returns filed up to fifteen years in the past.

Data from various other sources was found to be useful, although the adequacy of data from all public sources was limited by lack of specificity and inadequate disaggregation.

To obtain required data which were not publicly available major producers of the products covered by the study were contacted directly or through their trade associations and requested to provide data. The following rules governing the handling of company data were stressed:

- Company data would be treated in confidence
  - Access would be restricted to Booz, Allen & Hamilton, Inc. staff
  - Data would be used only for this study
  - Data would be presented in the final report so as not to be attributable to a specific producer.
- The names of companies contacted and providing data would not be disclosed.

The level of producer cooperation obtained varied from company-to-company and from industry-to-industry. Data for two industries was provided in aggregated form through the industry trade associations. Data of this type proved to be highly useful. In other cases, data of varying degrees of usability was provided. The results of producer contacts have produced the following conclusions:

- Producers are extremely reluctant to release any unpublished data related to tax matters.
  - Release normally requires the consent of the board of directors or the chief executive officer.
  - Obtaining consent is time consuming and requires repeated personal contacts at the senior executive level.

- Delivery of specific tax data requires a significant producer clerical effort which must be delivered on a spare time basis.

Those producers which declined to provide data most frequently expressed the following reasons:

- Company policy regarding the release of proprietary data
- The pertinence of data to ongoing tax litigation
- Lack of staff available to gather and summarize the data
- The high cost of gathering and summarizing the data
- Misgivings regarding Government use of the data

The data obtained from producers and from published sources, however, were sufficient to permit the development of reasonably accurate tax impact estimates.

5. THE IMPACT OF DISCRIMINATORY TAXATION ON RELATIVE MATERIALS COSTS WAS COMPUTED

The impact of discriminatory taxation on relative materials costs was computed using best available data. Where specific tax data were limited, a synthesis approach was used which was weighted against understating possible tax impacts. The methods used to compute tax impacts for each product of interest are explained in detail in Chapters III-VII of this report. Impacts are summarized on Exhibits IV and V, following this page.

6. THE SIGNIFICANCE OF COST DIFFERENTIALS RELATED TO DISCRIMINATORY TAXATION WAS ASSESSED IN TERMS OF RAW MATERIALS CHOICES

The significance of raw materials cost differentials related to discriminatory taxation was assessed for each product of interest

EXHIBIT IV

MAXIMUM ESTIMATED IMPACT OF DISCRIMINATORY TAXES AND TAX BENEFITS ON THE COST OF SELECTED COMMODITIES - 1972

Tax Element	Aluminum ($ Per Ingot Ton)	Pulp & Paper		Glass ($ Per Ton)	Steel ($ Per Ton of Raw Steel)	Petroleum ($ per BBL) For 1971	Natural Gas ($ per MCF) For 1971
		Newsprint ($ Per Ton)	Paperboard ($ Per Ton)				
Percentage Depletion	$ 1.35	$ -	$ -	$0.20	$0.90	$0.25	$0.015
Foreign Tax Treatment	1.51	-	-	-	0.27	0.13	-
Expensing of Mine Exploration & Development Expenditures	1.02	-	-	-	0.27	-	-
Expensing of Intangible Drilling & Development Costs	-	-	-	-	-	0.01	0.002
Capital Gains Treatment of Income From Timber Sales	-	1.14	2.48	-	-	-	-
Minimum Tax on Preferences	-	-	-	-	-	(0.04)	(0.002)
State and Local Resources Taxes	(0.08)	-	-	-	(0.19)	(0.06)	(0.007)
Total (After Tax)	$3.80	$1.14	$2.48	$0.20**	$1.25	$0.29	$0.008
% of Price	0.7	0.7	1.4 - 2.2	1.4	1.7*	9.8	4.4
Total (Before Tax)	$7.92	$2.28	$4.96	$0.40	$2.60	$0.60	$0.017
% of Price	1.5	1.4	2.8 - 4.3	2.7	3.5*	20.2	9.3

* Percent of estimated average cost of producing raw steel @ $75.00 (ton)

** Includes estimated percentage depletion for limestone, soda ash (a limestone derivative) and feldspar

Note: Impacts are shown as tax savings associated with tax benefits (after tax basis). Before tax impacts represent the amount that prices would have to be increased to fully affect the effects of the removal of tax benefits.

EXHIBIT V

ESTIMATED IMPACT OF DISCRIMINATORY TAXES AND TAX BENEFITS ON THE COST OF PRODUCING SELECTED PLASTIC AND RUBBER PRODUCTS - 1971

($ PER POUND)

	LOW				HIGH			
	After Tax		Before Tax		After Tax		Before Tax	
Products	$	% of Price	$	% of Price	$	% of Price	$	% of Price
High Density Polyethelene	0.0004	0.27	0.0008	0.54	0.0007	0.52	0.0014	1.04
Low Density Polyethelene	0.0002	0.16	0.0004	0.32	0.0006	0.47	0.0012	0.54
Polyvinyl Chloride	N/A	N/A	N/A	N/A	0.0003	0.23	0.0006	0.46
Polystyrene	0.0004	0.25	0.0008	0.50	0.0009	0.72	0.0018	1.42
SBR (Synthetic Rubber)	0.0007	0.2	0.0014	0.4	0.0017	0.7	0.0034	1.4

Note: Impacts are shown as tax savings associated with tax benefits (after tax basis). Before tax impacts represent the amount that prices would have to be increased to fully offset the effects of the removal of tax benefits.

in terms of their possible influence on raw materials choices. The following specific factors were considered in each case:

- Cost differentials
- The market availability of secondary materials
- Technological aspects of secondary materials use

* * * *

The following chapter discusses taxes and tax incentives found to be discriminatory.

II. TAXES AND TAX INCENTIVES

There are no unique taxes or tax incentives applicable to the users of secondary raw materials which are not also applicable to users of virgin raw materials. Taxes and tax incentives applicable only to producers and users of primary raw materials are identified and discussed in the balance of this chapter. The following topics are included:

- Depletion
- Minimum Tax on Tax Preferences
- U.S. Tax treatment of taxes paid to foreign governments
- State and local taxes
- Tax treatment of mine exploration, intangible drilling and development costs
- Tax treatment of capital gains

A discussion of the relationships among certain tax incentives is provided in the last section of the chapter.

1. DEPLETION

Depletion is the exhaustion of mineral resources as a result of extraction. A deduction is allowed on tax returns in order to compensate mineral producers for capital consumed in the process of extraction. The depletion tax deduction may be computed on the basis of cost (cost depletion) or on the basis of a percentage (percentage depletion) of the gross income from mining, whichever results in the greater tax deduction.

EXHIBIT VI

PERCENTAGE DEPLETION RULES

Mineral	Percent		Mining Process*
Iron Ore	U.S. Foreign	15% 14%	Extraction from the Ground Transportation to the plant or mills for other mining processing if within 50 miles Sorting) When applied for purpose of Concentrating) bringing to shipping grade Sintering) and form Loading for shipment
Coal	U.S.	10%	Extraction from the ground Transportation to the plant or mills for other mining processing if within 50 miles Cleaning Breaking Sizing Dust Allaying Treating to prevent freezing Loading for shipment
Bauxite Anorthosite Clay Laterite	U.S. Foreign	22% 14%	For Ores Customarily Sold in the Form of a Crude Mineral Product: Extraction from the ground Transportation to the plant or mills for other mining processing if within 50 miles Sorting) When applied for purpose of Concentrating) bringing to shipping grade Sintering) and form Loading for shipment For Ores Not Customarily Sold in the Form of a Crude Mineral Product: Extraction Transportation to the plant or mills for other mining process if within 50 miles Crushing Grinding Beneficiating Cyanidation Leaching Crystalization Precipitation (excluding electrolytic deposition, roasting, thermal or electric smelting or refining) Equipment processes
Limestone Quartzsand Quartzite Nepheline Syenite Feldspar Lithium (Foreign)	U.S.	14%	Extraction Transportation to the plant or mills for other mining process if within 50 miles Crushing and grinding (not fine pulverization) Size classification Drying to remove free water (not to change physical or chemical identity or composition Washing or cleaning (not to activate or change the physical or chemical structure)
Natural Gas and oil	U.S. & Foreign	22%	Extraction at the well before conversion or transportation

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* Processes included for purposes of computing gross income

The basis for cost depletion is the total value of a mineral deposit, with value defined as the cost to the producer of the mineral deposit, (land, mineral rights, cost of developing the deposit, etc.) divided by the total estimated recoverable mineral units (e.g., tons of coal) in the deposit. The quotient provides the unit basis for cost depletion. Cost depletion for a given period is computed by multiplying the number of mineral units extracted during that period times the unit depletion basis.

Percentage depletion is measured by applying the percentage provided in the Internal Revenue Code for the particular mineral to the gross income (defined below) from its extraction. Exhibit VI, following this page, lists the various minerals covered by this study and the applicable percentage depletion rates. The Exhibit also shows the point in the processing of the mineral at which a price is applied to determine the gross income for computing percentage depletion.

(1) Depletion Allowances in Excess of Cost Were Initially Allowed to Encourage Development of Mineral Sources

The depletion allowance, specifically percentage depletion, is an extention of the discovery value concept originating during the gold rush days of 1849. Under this concept, the fair market value of a mine (its discovery value) could be substantially greater than the cost of mine development. In 1918 Congress recognized the discovery value concept by allowing depletion to be taken on the fair market value of the property at the time of the discovery or within 30 days thereafter. Because the regulations governing depletion on the basis of fair market value were difficult to administer, percentage depletion was adopted in 1926 for oil and gas and in 1932 for coal, metals, and sulphur. The 1964 Internal Revenue Code extended the percentage depletion allowance to almost all metallic and nonmetallic minerals.

(2) The Measure of the Tax Benefit Provided by Depletion is the Reduction in Taxes Payable Associated With Using Percentage Depletion in Preference to Cost Depletion

The deduction for cost depletion is limited to actual producer costs; the deduction for percentage depletion, however,

is available even though producer investment has been fully recovered. The deduction for percentage depletion can exceed the original cost of the property. Therefore, percentage depletion, to the extent that it exceeds cost depletion, is considered to provide a discriminatory tax benefit for purposes of this study.

(3) The Tax Rules Pertaining to Percentage Depletion Include Precise Definitions and Income Limitations

The amount of the percentage depletion deduction is dependent not only on the depletion precentage used but also on the following three factors:

- A precise definition of "gross income" to which the depletion precentage is applied and from which taxable income is calculated
- A maximum limit on the amount of percentage depletion which can be claimed of 50% of the taxable income from mining properties
- There are a multitude of definitions for "mining properties". A mining property is generally defined as each separate interest owned by a taxpayer in each mineral deposit in each separate tract or parcel of land. Under the tax code, certain mineral interests may be aggregated in computing depletion and taxable income. Thus, if the amount of taxable income from a property does not permit the full amount of available depletion to be taken, due to the 50% limitation, then the combination of income from that property with income from other properties which have taxable income in excess of the 50% limit, may permit the full amount of the depletion deduction taken to be increased. The rules governing aggregation are extremely complex.

The definition of gross income and the 50% limit on taxable income for percentage depletion are presented below.

Definition of Gross Income

Gross income is defined separately for oil and gas producers and for mining operations. Oil and gas gross income is determined by the amount for which the oil or gas is sold at the well head or near the vicinity of the well. If the oil or gas is not sold at the well head and other production, transportation, or manufacturing costs are incurred by the extractor, then gross income is computed by using the representative market or field price at the well head.

Gross income for mining operations is not limited to the sales value at the mine but is extended to include the value of certain treatment processes and transportation costs to the treatment plant. The treatment process are listed in the tax code (see Exhibit I). If the minerals are not sold after the allowable treatment which would determine gross income, a representative market or field price must be used to calculate gross income.

Representative field prices are determined for an ore or mineral of a like kind or grade. The weighted average of competitive selling prices is an important factor in determining the field prices. Prices established in a transaction between divisions of an integrated producer cannot be used.

Taxable Income Limitations

The total amount of percentage depletion which can be claimed is limited to 50% of the taxable income from a mining property. The taxable income from a mining property is calculated by deducting from gross income the development expenses deducted in computing taxable income, costs of exploiting the natural resource including the maintenance of geological and land departments, interest on money borrowed to develop mines, state income taxes, and a fair share allocation of overhead items. The depletion deduction itself and charitable contributions are not deducted from gross income in arriving at the taxable income for the 50% limit computation.

2. MINIMUM TAX ON TAX PREFERENCES

Under the Tax Reform Act of 1969, Congress imposed a 10% tax, effective for years ending after 1969, on items designated as preference items. Preference items were identified as those items in the tax code which, while available to all taxpayers, are advantageous primarily to high income taxpayers, and the application of which results in the reduction of a taxpayers effective tax rate. The excess of allowable percentage depletion, over the adjusted cost of a mineral property is defined as a tax preference item. Also, for a corporation in the 48% tax rate bracket, 3/8 of total capital gains claimed is a tax preference item.

The tax on preferences is levied primarily on domestic source income. The tax is imposed on the total amount of tax preferences less the following amounts:

- A $30,000 annual exemption per corporation
- The income taxes paid for the taxable year, excluding income taxes on accumulated earnings and personal holding companies.

If the $30,000 exemption plus the regular income tax liability is in excess of the total amount of tax preferences available, the excess amount may be carried forward for seven years and used to offset the preference items in the following years.

The tax reduces the effective tax benefit of percentage depletions and capital gains. Accordingly, the minimum tax on preferences mitigates the benefits provided by certain tax incentives. For the oil and gas companies this reduction has been estimated to be from 2.5 to 4 percent of the percentage depletion benefit. The impact of the minimum tax on preferences on the other materials considered in the study is lower.

3. U.S. TREATMENT OF TAXES PAID TO FOREIGN GOVERNMENTS

The regulations governing foreign taxes are applicable to all foreign operations of U.S. companies. For purposes of this study, however, the impact of the tax rules are treated as applying to primary material users and not to secondary material users due to the almost non-existent imports of secondary materials, and the fact that U. S. companies do not process post-consumer waste overseas.

The gross taxable income of corporations operating internationally can vary widely, depending upon international transfer pricing policies, corporate organization structure, the degree of integration of operations, and other factors.

(1) U. S. Companies That Pay Foreign Income Taxes Can Generally Credit Such Taxes Against Their U. S. Tax Liability

The United States taxes its citizens on their worldwide income. A U. S. company thus could be taxed on the same income by the U. S. government and also by a foreign government. Internal Revenue Service Code Section 901 allows a credit for the amount of income taxes imposed by foreign countries. The credit is intended to place foreign and domestic source income on an equal footing insofar as the United States income tax is concerned and is also designed to facilitate overseas investment.

Regulations pertaining to foreign tax credits are shown in Exhibit VII, following this page.

(2) The Measure of the Tax Benefit Associated With the Foreign Tax Credit is the Reduction in Taxes Payable Obtained by Treating Foreign Taxes Paid as a Credit Rather than as a Deduction

The magnitude of the benefit provided by foreign tax credits varies with the effective tax rate of the foreign countries imposing taxes and the treatment of the taxes paid on U. S. tax returns. Taken as a credit, foreign taxes are subtracted directly from the U. S. tax liability. Taken as a deduction, foreign income taxes reduce taxable income. The taxpayer has the option of treating foreign taxes paid as either a credit or a deduction. However, all foreign taxes must be treated uniformly.

EXHIBIT VII

REGULATIONS PERTAINING TO FOREIGN TAX CREDITS

1. A taxpayer who pays taxes to a foreign country may be entitled to a tax credit if his foreign source income is subject to U.S. income tax.

2. Limits on the Credit

   There are two alternative methods on computing the foreign tax credit--the "per country method" and the "overall" method. In neither case can the credit exceed the actual amount of foreign tax paid. (Refer to text for explanation)

3. Who Gets the Credit

   The credit is allowed to all citizens and corporations as to both taxes paid to a foreign country or a possession of the United States.

4. Special Rule for Foreign Mineral Operations

   A domestic mining company operating in a foreign country pays foreign taxes on its mineral income. It must also include its foreign mineral income, along with its other foreign income, in its U.S. tax base. Effective for tax years after 1969, the excess of foreign tax credits resulting from the allowance of a percentage depletion deduction on foreign mineral income cannot be used in determining the tax credit limit under the "overall" country method. A country by country calculation must be made of the effect of percentage depletion on U.S. taxes on foreign mineral income. The amount of foreign income taxes paid which can be included in determining the tax credit limit under the "overall" method must be reduced by the amount that the foreign income tax exceeds the amount of U.S. tax calculated after application of the depletion deduction. Any excess of foreign tax credits resulting from high foreign tax rates may, however, be included in determining the "overall" tax credit limit.

5. Credit of Domestic Corporation for Taxes of a Foreign Subsidiary

   A domestic corporation which owns 10% or more of the voting stock in a foreign corporation is entitled to a credit for a proportion, based on dividends received, of the taxes paid by the foreign corporation to a foreign country of United States possession. A credit is also allowed to a domestic corporation for foreign taxes paid by a subsidiary of a foreign corporation described in the preceding sentence. In such a case, however, in order for the credit to be available, the foreign corporation must own 50% or more of the foreign subsidiary's voting stock.

Where the effective tax rate of a foreign country is higher than the U. S. rate, a company may by using an "overall" limitation, claim a credit for the total taxes that it has paid to all foreign countries. The company's credit using the "overall" method is limited. The limit is determined by calculating the U. S. tax on all income, from all sources, including foreign and multiplying this amount by a fraction, the numerator of which is the total foreign taxable income and the denominator of which is total foreign and domestic income. For example, assume the following operating results for a company with operations in the U. S. and two foreign countries:

	Taxable Income
Country A	$1,000
Country B	1,000
U. S.	1,000
Total	$3,000

If income were to be taxed separately in each country, the applicable taxes would be:

	Taxable Income	Tax Rate	Tax
Country A	$1,000	40%	$400
Country B	1,000	60%	600
U. S.	1,000	48%	480

If all income, regardless of source, were subject to U. S. taxes, the applicable U. S. tax would be:

	Taxable Income	Tax Rate	Tax
U. S.	$3,000	48%	$1,440

Under the "overall" method, the maximum foreign tax credit would be computed as follows:

$$\frac{\$2,000 \text{ (Total Foreign Taxable Income)}}{\$3,000 \text{ (Total Taxable Income)}} \times \$1,440 = \$960$$

Thus, while the company paid $1,000 ($400 + $600) in foreign taxes, the allowable tax credit under the "overall" method is limited to $960.

If the allowable tax credit were computed on a "per country" basis, it would be limited to $880 as follows:

$$\frac{\$1,000}{\$3,000} \times \$1,440 = \$480$$

Since the tax paid in Country A was $400, the allowable tax credit is limited to $400 as the tax credit cannot exceed the tax paid in each country. The allowable tax credit for taxes paid in Country B, however, is limited to $480 by the above formula even though $600 in taxes were actually paid.

Exhibit VIII, following this page, summarizes relevant tax legislation of Venezuela, Canada, and Jamaica. These countries host important U. S. mineral operations.

(3) United States Law Provides Several Other Methods of Sheltering Earnings of Foreign Operations From the full Effect of U. S. Taxation

Under U. S. tax regulations, a corporation engaged in foreign trade can organize and conduct operations in such a way as to minimize the effects of the U. S. tax burden on overseas enterprises. The regulations are numerous and the provisions extremely complex. The more important means of managing foreign operations to achieve maximum tax savings are presented below.

- Western Hemisphere Trade Corporations

  U. S. corporations controlling foreign based mining enterprises can operate as "Western Hemisphere Trade Corporations" (WHTC).

  They can do so by incorporating a domestic subsidiary which controls overseas operations. A subsidiary can qualify as an WHTC if:

  - Its entire business, other than incidental purchases, is carried on in the Western Hemisphere.

EXHIBIT VIII

SUMMARY OF FOREIGN TAXES OF COUNTRIES THAT HOST IMPORTANT EXTRACTIVE INDUSTRIES

The Range of Foreign Taxes and Their Impact Upon Gross and Taxable Income Varies Widely, Depending Upon International Transfer Pricing Policies, Corporate Organizational Structure and Degree of Integration of Operations. Below is a Summary of Relevant Tax Legislation of Three Countries that Host Important U. S. -Owned Extractive Industries

VENEZUELA (1)

Corporations, partnerships and joint ventures which are engaged in the exploitation of mines, hydrocarbons and related activities are subject to a tax for all their income. Their gross income comprises the amount of sales. Exports of petroleum and iron are, whether procured or not, considered as sales. The National Executive establishes basis for export prices. When the reference prices exceed realized prices, an extra income tax payment will be made for the tax on the difference between the taxable income from the books and that using the reference prices. Depletion, depreciation and amortization of assets are allowed.

Depreciation--The cost of the concession is considered to be its purchase price and related expenses plus the initial exploitation and all exploration taxes.

Depletion--Is calculated in the unit of production basis, taking into consideration the unamortized cost, the proven reserves for the area and the production of the field.

Exploration expenses, tangible and intengible drilling costs are also allowed.

The income tax rate for income from oil and mining activities is a flat 60%, but the following adjustments to the tax may be applicable:

- Credit for new investment
- Credit for increase in export sales
- Credit for losses
- 50-50 tax (discussed below)

50-50 tax-companies engaged in the extraction of petroleum or mining are subject to an additional tax (50-50 tax). The tax is calculated by subtracting from the net after-tax income the total taxes incurred during the year, any excess is taxed at 50%.

In addition, other provisions of Venezuelan Law may be applicable to a particular company's activities.

CANADA (2)

The following provisions of Canadian law apply to mining and petroleum. Otherwise, mining and petroleum companies operating in Canada are subject to the same rules that apply to all Canadian corporations. The corporate tax rate in Canada for 1972 is 50%.

- Taxpayers whose principal business is not mining or petroleum are allowed deductions for Canadian exploration and development expenses.

- All taxpayers are allowed deductions for foreign exploration and development expenses.

- Acquisition of mining properties and royalty interests treated as exploration and development expenses, and proceeds on disposals of such properties are fully taxable subject to transitional rules for those owned at December 31, 1971.

- Three year tax exemption for new mines are to be withdrawn after 1973 and replaced by an accelerated writeoff of capital equipment and on-site facilities, including townsite facilities such as sewage plants, roads, hospitals and schools. The accelerated writeoff also applies to a major expansion of an existing mine where capacity is increased by at least 25%.

- The present system of automatic percentage depletion for operators (33%) and nonoperators (25%) will continue until 1976. However, after 1976, depletion will be based on amounts expended on eligible expenditures since November 7, 1969. Taxpayers will be allowed $1 of of depletion for each $3 of eligible expenditures with a limit of 33-1/3% of production profits per year. For this purpose, royalty income will be deemed to be production profits.

- A Federal corporate tax abatement on mining profits of 15 percentage points was also introduced. This abatement which commences in 1977 will also apply in the Yukon and Northwest Territories.

JAMAICA (3)

Mining companies are subject to the same regulations governing all corporations operating in Jamaica. All companies pay a basic company profits tax and an "additional" company profits tax. The rate depends upon the class of company (agricultural, open, intermediate or close) and it ranges from 25% to 35%. The rate of additional company profits tax is 15%.

In addition, there are certain import duties, tonnage taxes, excise taxes applicable to all companies, and preferential legislation has been enacted to cover various industries. No such legislation exists for bauxite operations although special concessions have occasionally been granted to attract foreign capital into the island.

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(1) Petroleum and iron ore
(2) Principally iron ore
(3) Bauxite

- Its gross income for the current taxable year and the two preceding taxable years was derived:
    - 95% or more from sources outside the United States
    - 90% or more from the active conduct of a trade or business

A WHTC is allowed, as a deduction in computing the amount of income subject to tax, an amount equal to a fraction of its taxable income as computed without this deduction. For 1971 and subsequent years, the deduction is 14/48 or approximately 29.17%--a reduction of close to one third in the amount of U.S. tax otherwise payable. Other advantages of the WHTC are discussed in Exhibit IX, following this page. As indicated in the Exhibit, the second main advantage of a WHTC is that domestic shareholders are not taxed on dividends until they are received and corporate shareholders, in addition, are not taxed on 85%-100% of dividends received. Without the WHTC benefit, dividends from a foreign corporation would be taxed not as received, but as earned and the exemption of 85%-100% of dividends received from taxation would not apply.

Less Developed Country Corporations (LDCC)

Special tax treatment is also available to Less Development Country Corporations (LDCC). An LDCC is a corporation operating in a less developed country as designated by the President of the United States which derives at least 80% of its gross income in the less developed country, and has at least 80% of its assets invested in such a country.

The tax benefit associated with an LDCC involves the regulations covering the taxation of dividends received from a foreign corporation. Normally, dividends received from a foreign corporation are taxed on the full amount of the dividend declared, regardless of the amount of tax paid on that dividend to a foreign government. U.S. taxes on dividends received from an LDCC may be computed on the net amount of dividends received, after deducting taxes paid to foreign governments.

EXHIBIT IX

RELATIVE TAX ADVANTAGES OF USE OF WESTERN HEMISPHERE TRADE CORPORATION

THE GREATEST ADVANTAGE OF USING A WHTC TO CONDUCT FOREIGN OPERATIONS IS THAT, AS A U.S. CORPORATION, THE DOMESTIC SHAREHOLDERS ARE NOT TAXABLE ON IMAGINARY DIVIDENDS NOT ACTUALLY RECEIVED FROM IT. ADDITIONALLY, CORPORATE SHAREHOLDERS ARE ALLOWED THE DIVIDENDS RECEIVED DEDUCTION (100% OR 85%) FOR DIVIDENDS RECEIVED FROM A WHTC

OTHER VALUABLE ADVANTAGES OF A WHTC INCLUDE:

- THE INCOME OF A WHTC IS SUBJECT TO U.S. TAX AT 34/48THS (OR 70.8%) OF THE FULL CORPORATION TAX RATE, WHEREAS INCOME OF THE FOREIGN CORPORATION IS TAXABLE TO ITS U.S. SHAREHOLDERS AT THE FULL CORPORATION OR INDIVIDUAL TAX RATE, EITHER WHERE ACTUALLY DISTRIBUTED TO THEM OR WHERE REQUIRED TO BE REPORTED BY THEM AS IMAGINARY DIVIDENDS.
- IT IS POSSIBLE TO TRANSFER PROPERTY TO A WHTC IN EXCHANGE FOR SHARES OF ITS STOCK TAX-FREE (WITHOUT CAPITAL GAIN). ON THE OTHER HAND, TRANSFERS OF PROPERTY TO A FOREIGN CORPORATION IN EXCHANGE FOR ITS STOCK REQUIRE CLEARANCE FROM THE INTERNAL REVENUE SERVICE.
- THE DOMESTIC PARENT COMPANY OF A WHTC IS TAXABLE ON NOT MORE THAN 15% OF DIVIDENDS ACTUALLY RECEIVED FROM THE WHTC; IS TAXED AT THE CAPITAL GAIN RATE ON GAINS REALIZED ON A SALE OF STOCK OF A WHTC; AND CAN LIQUIDATE THE CORPORATION TAX-FREE – THAT IS, WITHOUT RECOGNITION OF GAIN. ON THE OTHER HAND, THE DOMESTIC PARENT OF A CFC (CONTROLLED FOREIGN CORPORATION) NOW IS TAXABLE AT THE FULL CORPORATION TAX RATE (48% OF ALL OVER $25,000) WITHOUT ALLOWANCE OF THE DIVIDENDS RECEIVED DEDUCTION, ON ALL EARNINGS OF A FOREIGN CORPORATION EITHER (1) WHEN EARNED BY THE FOREIGN CORPORATION, BEFORE BEING DISTRIBUTED BY IT, OR (2) PRIOR TO DISTRIBUTION OF SUCH EARNINGS.
- UNITED STATES SHAREHOLDERS OF A CFC ARE REQUIRED, IN MANY INSTANCES, TO PAY DOMESTIC TAXES ON ITS FOREIGN-EARNED INCOME BEFORE SUCH INCOME IS ACTUALLY DISTRIBUTED TO THEM, WHEREAS A WHTC IS SUBJECT TO UNITED STATES TAX CURRENTLY.
- A UNITED STATES CORPORATION THAT IS A SHAREHOLDER OF A WHTC CAN GET CAPITAL GAIN TREATMENT OF GAIN ON A SALE TO IT OF A PATENT, INVENTION, OR SIMILAR PROPERTY, WHEREAS GAIN ON A SIMILAR SALE TO A FOREIGN CORPORATION CONTROLLED BY THE DOMESTIC CORPORATION IS DENIED CAPITAL GAIN TREATMENT AND TAXED AS ORDINARY INCOME.
- THE INCOME OF A WHTC CAN BE INCLUDED IN A UNITED STATES CONSOLIDATED INCOME TAX RETURN, WITHOUT LOSS OF THE SPECIAL WHTC DEDUCTION.
- A WHTC CAN OBTAIN THE BENEFITS OF TAX TREATIES OF THE UNITED STATES WITH OTHER COUNTRIES.
- THE WHTC AND ITS SHAREHOLDERS ARE SPARED THE HEAVY BURDEN OF INCREASED ACCOUNTING AND REPORTING REQUIREMENTS IMPOSED BY THE UNITED STATES ON SHAREHOLDERS OF A CFC.

The tax benefit associated with an LDCC is somewhat limited by the provisions governing foreign tax credits. For non LDCC's a credit can be taken for the full amount of foreign taxes paid on dividends received. The amount of the credit which can be taken for foreign taxes paid on dividends received from an LDCC is limited to the effective foreign tax rate applied to the cash dividend actually received (dividend declared, less foreign taxes paid).

- U.S. Corporation in a U.S. Possession

A U.S. domestic corporation that receives 80% or more of gross income for three years from sources in U.S. possessions, and 50% of its gross income is from trade or business (as opposed to interest) in the possession, may qualify income for exemption from taxation. The applicable U.S. possessions are specifically defined in the tax code; they include the Panama Canal Zone, Wake and Midway Islands, but do not include the Virgin Islands or Puerto Rico.

- Controlled Foreign Corporations

A controlled foreign corporation (CFC) is the least advantageous means of operating a business abroad. If an CFC is established, it should be operated and organized in such a way as not to allow dividends to be taxable to its U.S. shareholders as imagninary dividends under Subsection F. Income exempt from such treatment includes:

- Income from producing goods abroad
- Income from sales of goods for use, consumption, or depreciation with the country of incorporation.

The timing of the repatriation of profits and the exclusion of Controlled Foreign Corporation can also impact U.S. tax liabilities.

- When profits of U.S. owned foreign operations are declared to the permanently reinvested. U.S. taxes do not need to be paid or accrued.

- When imaginary dividends are declared, a company merely accrues U.S. taxes on its books. Such taxes are paid when dividends are actually repatriated.

Tax aspects of each form of organization vary, but adequate tax planning allows U.S. enterprises to reduce their income tax liability.

4. STATE AND LOCAL TAXES

Various states impose severance, occupation and modified property and local jurisdictions taxes on timber lands, mines and wells. These taxes tend to act as a disincentive to production of virgin materials.

Taxes are identified in Exhibit X, following this page, for certain important virgin raw material producing states. As the Exhibit shows, these taxes vary substantially in amount, rate, and form of application.

State taxes pertaining to forest lands are discussed in Exhibit XI. These taxes, tax rates, and their applicability also vary greatly from state to state. Some act of incentives, some as disincentives.

5. MINE EXPLORATION AND DEVELOPMENT EXPENDITURES AND INTANGIBLE DRILLING AND DEVELOPMENT COSTS

Both miners and oil and gas producers may elect for tax purposes to expense certain exploration and development expenditures.

(1) Under Certain Circumstances, Mine Exploration and Development Expenditures May Be Deducted Currently

Domestic mining companies (excluding oil and gas producers) may expense all mine exploration expenditures provided that the amount expensed is recaptured once the mine reaches production or is sold. Recapture is accomplished as previously deducted exploration expenditures are included in income or if the mining company reduces the amount of depletion claimed.

EXHIBIT X

STATE AND LOCAL TAX LAWS
APPLICABLE TO CERTAIN RAW MATERIALS

Commodoty	Major Producing State	Type of Tax	Tax Rate
Iron Ore	Minnesota	Occupational Tax on Mining	15½% of value of iron ore at the mine less credits for labor on low grade ores research and exploration (reducing rate to about 14%)
			15% of value of Taconites, Semi-Taconites and Iron Sulphides
		Royalty Tax	15½% for permission to explore and mine (gross value of mining is reduced by royalty tax to avoid duplication of tax)
		Occupational Tax on Production of Taconites, Iron Sulphates and Derived Concentrates	11½% per gross ton plus 1/10¢ per ton for each 1% iron content in excess of 55% (higher rate applies if price index is over 110) Added tax on production (per gross ton): 1971 - 4¢ 1972 - 7¢ 1973 - 9¢ 1974 - 9¢ 1975 - 10¢ 1976 - 10¢ 1977 - 12¢ 1978 - 12¢
	Michigan	Production Tax	Low grade iron ore is taxed during mine construction at 1% of annual capacity multiplied by percentage of completion of construction after construction tax rate is 2% of annual average production
			Underground beneficiated and agglomerated tax iron ore is taxed at 2% to 3% of property depending upon annual shipments and process involved.
Bauxite	Arkansas	Severance Tax	15¢ per ton
Petroleum	Texas	Production Tax	Oil production tax is 4.6¢ per 42 gallon barrel of oil (if value exceeds $1 per barrel, tax is 4.6% of market value)
		Petroleum Tax	Crude petroleum tax is 3/16¢ per 42 gallon barrel
	Louisiana	Production Tax	18¢ to 26¢ per 42 gallon barrel depending upon gravity
	California	Production Tax	Rate per barrel is determined annually depending upon the amount required to support the division of oil and gas. Rate has been running at .0035¢ per 42 gallon barrel
	Oklahoma	Production Tax	5% of gross value of production on the first $150 monthly gross if producing under 3 barrels daily and 7% on the balance
Gas	Texas	Production Tax	7½% of market value (condensates are taxed at lower oil rate)
	Louisiana	Severance Tax	2.3¢ per MCF (effective July 1, 1974, 11½% of value at severance)
	California	Production Tax	See Petroleum. Rate has been running at about .0035¢ per 10,000 cu ft. of gas
	New Mexico	Ad Valorem Tax	Ad Valorem Production tax based on assessed value of 150% of product value (less royalities and trucking) times assessment ratio which is certified locally
		Conservation Tax	.14% of severed value
		Emergency School Tax	2.55% of severed value
		Natural Gas Processors Tax	45/100% of product value
		Severance Tax	2¼% of severed value
		Production Equipment Tax	27% (9% prior to May 5, 1972) of product value times assessment ratio levied on production equipment for severance, treatment or storage
Coal	West Virginia	Privilege Tax	Business and occupational tax - 3.5% of gross proceeds or gross income
		Special local taxes on production of natural resources	Local taxes range from 1/2% to 1% of gross income
	Kentucky	Severance Tax	4% of sales, minimum 30¢ per ton strip mines are also under special license
Sand and Gravel	California	None	
	Missouri	None	
	New Jersey	None	
	Illinois	None	

EXHIBIT XI

STATE TAX LAWS APPLICABLE TO TIMBER OPERATIONS

	STATE TAX LAWS APPLICABLE TO FOREST LANDS GENERALLY FALL INTO FOUR GROUPS: (1) EXEMPTION AND REBATE LAWS, (2) MODIFIED PROPERTY TAX LAWS, (3) YIELD TAX LAWS, (4) SEVERANCE TAX LAWS. MODIFIED PROPERTY TAX LAWS IN TURN FALL UNDER THREE SUBGROUPS: (1) MODIFIED ASSESSMENT, (2) MODIFIED RATE, (3) DEFERRED PAYMENT.	
TIMBER	EXEMPTION AND REBATE TAXES* ALABAMA, CALIFORNIA, COLORADO, HAWAII, IDAHO, IOWA, NEW HAMPSHIRE, NEW JERSEY, NORTH CAROLINA, PUERTO RICO, RHODE ISLAND	REMOVES FOREST LANDS AND TIMBER OR TIMBER ALONE FROM THE PROPERTY TAX ROLLS EITHER FOR A TERM OF YEARS OR, IN SOME CASES, INDEFINITELY. TO QUALIFY FOR EXEMPTION, FOREST TRACTS MAY NEED TO COMPLY WITH CERTAIN FOREST MANAGEMENT REQUIREMENTS. REBATE LAWS PERMIT LANDOWNER TO APPLY FOR ABATEMENT OF TAXES LEVIED
	MODIFIED PROPERTY TAX LAWS* ALABAMA, ARKANSAS, CONNECTICUT, FLORIDA, HAWAII, IDAHO, INDIANA, IOWA, LOUISIANA, MAINE, MARYLAND, MASSACHUSETTS, MICHIGAN, MINNESOTA, MISSISSIPPI, MISSOURI, NEW HAMPSHIRE, NEW JERSEY, NEW MEXICO, NEW YORK, NORTH DAKOTA, OHIO, OREGON, PENNSYLVANIA, PUERTO RICO, RHODE ISLAND, VIRGINIA, WASHINGTON, WISCONSIN	UNDER THE MODIFIED PROPERTY TAX LAWS OF THE MODIFIED ASSESSMENT TYPE, A FIXED ASSESSMENT PER ACRE MAY BE PROVIDED. THE MODIFIED RATE LAWS ARE VARIED BUT HAVE IN COMMON THE USE OF A TAX RATE THAT DIFFERS FROM THE MILLAGE RATE APPLICABLE TO REAL PROPERTY IN GENERAL
	YIELD TAX LAWS:* ALABAMA, CONNECTICUT, HAWAII, IDAHO, LOUISIANA, MASSACHUSETTS, MICHIGAN, MINNESOTA, MISSISSIPPI, MISSOURI, NEW HAMPSHIRE, NEW YORK, OREGON, WASHINGTON, WISCONSIN	YIELD TAX LAWS ARE DESIGNED TO AID FORESTRY BY RELIEVING TIMBER FROM PAYMENT OF ANNUAL PROPERTY TAXES AND IMPOSING INSTEAD A TAX AT THE TIME OF TIMBER HARVEST
	SEVERANCE TAXES* ALABAMA, ARKANSAS, LOUISIANA, NEW MEXICO, OREGON, VIRGINIA	SEVERANCE TAXES ARE SIMILAR IN SOME RESPECTS TO YIELD TAXES BUT IMPOSED SOLELY FOR REVENUE PURPOSES

* TAX RATES AND APPLICABILITY VARY WIDELY FROM STATE TO STATE

SOURCE: TIMBER TAX JOURNAL, 1972
FOREST INDUSTRIES COMMITTEE ON TIMBER VALUATION AND TAXATION
WASHINGTON, D.C.

Mine development expenditures may be expensed as incurred up to the point where the mine reaches full production. Depreciable property, such as trucks or buildings, however, must be capitalized. In addition, expenditures for the purpose of decreasing operating costs may not be expensed.

Once full production is reached, expenditures to maintain the established production as the working face of the mine recedes may be expensed.

(2) Intangible Drilling and Development Costs May Be Expensed as Incurred

Oil and gas producers may expense intangible drilling and development costs as they are incurred. Such costs include labor, fuel, power, materials and supplies, rentals and other expenditures necessary to locate and develop a well. Expenditures for tangible or salvageable assets may not be expensed, however, as they may be reused in other locations.

(3) The Tax Benefits Associated With Current Write-Offs Depend on the Amount and Timing of the Tax Deferment and the Taxpayer's Opportunity Cost of Capital

The benefit derived from the write-off of certain costs as expenses rather than as depreciation can be measured by the present value the deferred tax payments.

6. CAPITAL GAINS

Under Federal tax regulations, gains from the sale or exchange of certain capital assets held for more than six months are provided preferential tax treatment. The gains from such a sale are taxed at a lower effective rate than are normal operating profits. The basis for this preferential tax treatment is that capital gains accumulate over the period (often an extended period) that assets are held but are realized when the assets are sold or exchanged.

Timber is particularly affected by capital gains since timber producers may treat the cutting of timber for sale or use as a capital gain. Prior to 1944, capital gains treatment was available only for the sale of a timber tract. In 1944 capital gains treatment was extended to cover timber harvesting. Similar treatment is available to companies disposing of coal or domestic iron ore under royalty contracts.

(1) Proceeds From the Sale or Exchange of Timber Are Subject to Capital Gains Treatment

Capital gains from timber disposal may result from the following:

- Sale of standing timber
- Disposal of timber under a cutting contract (includes Federal and privately owned lands)
- Cutting by the taxpayer

In each case, the timber must be held for six or more months. Each of the above means of disposal is discussed below:

- Sale of standing timber. Capital gains on the sale of standing timber are computed as the difference between the sales price and the adjusted cost of the timber to the seller.

- Disposal under a cutting contract. The excess of the payments received under a cutting contract over the adjusted cost of the timber may be treated as a capital gain. A cutting contract is a lease with payments based on the amount of timber cut. To qualify for capital gains under a cutting contract, the trees need not be cut into lumber. Christmas trees, cordwood and pulpwood also quality. This is applicable on both Federal and private lands.

- Timber cut by owner. A taxpayer (individual or corporate) cutting owned timber for sale or own use, may elect capital gains treatment. Capital gains, however, must be taken on the amount of timber cut in a given taxable year, whether it is sold or not.

The capital gains election is binding and applies to all timber owned by the taxpayer cut in subsequent years. IRS permission is needed for any change.

If a capital gain election is not made, no gain or loss is recognized when the timber is cut, but income is recognized when the timber is sold in the form of logs, pulpwood, or firewood and is taxed as ordinary income.

(2) Capital Gains Treatment is Available to Taxpayers Disposing of Coal or Domestic Iron Ore Under Royalty Contracts

If a producer disposes of coal or iron ore which has been held for six months or more under a contract retaining an economic interest in the coal or iron ore (a royalty contract) he may elect capital gains treatment.

7. IF PARTICULAR TAX INCENTIVES ARE ELIMINATED, ALTERNATIVE TAX TREATMENTS MAY BENEFICIALLY BE USED

As indicated in the previous sections, differential tax rates and tax treatment of some deductions and credits provide a tax advantage to selected groups of taxpayers. If the tax treatment resulting in special benefits is eliminated, alternative tax treatments are still available. Some of these alternative treatments have been discussed in defining the tax benefits, specifically for depletion, foreign tax credits, Western Hemisphere Trade Corporations, and capital gains taxes; for example, cost depletion would be taken in lieu of percentage depletion, and foreign taxes could be taken as a deduction instead of a credit.

If producers were not permitted to deduct exploration, and intangible drilling costs currently, an alternative to capitalization and depreciation would be an abandonment loss deduction. A depreciable asset which loses its usefulness and is abandoned is allowed a retirement loss deduction. Therefore, while it may be necessary to capitalize exploration and other costs initially, it will not be necessary to carry the costs if the drilling or mine explorations prove unsuccessful.

Therefore, the maximum impact of eliminating tax incentives would only occur if all tax options are closed. Since this is not likely to occur, any maximum impact analysis, such as those which follow, probably overstate the dollar impact of tax removal.

* * *

The following chapter discusses the impact of discriminatory taxation on the aluminum industry.

III. THE ALUMINUM INDUSTRY

This chapter addresses the impact of discriminatory taxes and tax benefits on the relative use of virgin and secondary materials in the production of aluminum.

1. THE ALUMINUM INDUSTRY IS COMPOSED OF TWO DISTINCT SUB-INDUSTRIES, PRIMARY ALUMINUM AND SECONDARY ALUMINUM

The primary and secondary aluminum industries are related but largely separate in terms of production processes used and markets served.

Primary aluminum producers can remelt industrial process aluminum scrap which is compatible in alloy content and purity with their primary products. Aluminum fabricators also remelt internally generated scrap. Neither primary producers nor fabricators are able to make extensive use of scrap of mixed alloy content.

Secondary aluminum smelters, which consume about 80% of the total aluminum scrap supply are capable of making use of most types of mixed alloy post-consumer scrap. About 90 percent of secondary aluminum output is marketed to the aluminum casting industry with the balance consumed in the production of steel.

While secondary aluminum may not be substituted for primary aluminum in most primary aluminum end uses, primary aluminum may be substituted for secondary aluminum in casting. At the present time about 20 percent of the aluminum consumed by the casting industry is obtained from primary producers.

For purposes of this analysis, secondary aluminum has been defined as functionally equivalent to primary aluminum at the aluminum ingot stage of production, subject to the limits on cross substitution mentioned above. Equivalency does not exist prior to the ingot stage as primary and secondary aluminum processing techniques are not compatible.

The secondary aluminum industry cannot make extensive use of recycled beverage cans due to their high magnesium content. Primary producers manufacturing can stock may remelt old beverage cans for reuse as can stock. While this is currently being done by several major primary producers the economics of this practice on a large scale are undefined. However, there may be difficulty in obtaining an expanded supply of old cans.

2. THERE ARE SEVERAL TAX BENEFITS AVAILABLE TO PRIMARY ALUMINUM PRODUCERS WHICH ARE UNAVAILABLE TO SECONDARY PRODUCERS

There are no identifiable taxes or tax benefits applicable to secondary aluminum production which are not also applicable to primary production. There are several elements of taxation, however, which are unique to primary production. They are as follows:

- Regulations providing tax benefits
    - The percentage depletion allowance on bauxite
    - The foreign tax credit
    - Western Hemisphere Trade Corporation allowances
    - Tax treatment of mine exploration and development costs
- State taxes applicable to bauxite mining

3. THE IMPACT OF EACH ELEMENT OF TAXATION ON THE COST OF PRODUCING PRIMARY ALUMINUM INGOT HAS BEEN COMPUTED

The impact of the taxes and tax benefits discussed above on the cost of producing primary aluminum ingot were computed for the period 1970-1972. The analysis covered producers accounting for approximately 70 percent of domestic bauxite consumption. The primary sources of data used in estimating tax impacts were financial statements and statistical data published by producers and the Aluminum Association, and copies of Form 10K filed by producers with the SEC.

Primary aluminum producers contacted, for the most part, were unwilling to provide tax data beyond that publicly available. One producer, however, did provide proprietary tax data which was used to verify impact estimates based upon analysis of published data. The analytical procedures used in preparing impact estimates are discussed below.

(1) Raw Materials Conversion Ratios Were Developed for Primary and Secondary Aluminum Manufacturing

To provide a basis for estimating tax impacts on a per unit of output basis, the following materials conversion ratios were developed:

Material Inputs to Produce 1 Ingot Ton of Primary Aluminum Ingot

Material	Quantity
Bauxite	4.0 tons
Baked Carbon	0.6 tons
Cryolite	0.03 tons
Aluminum Fluoride	0.04 tons

Analysis of tax impacts was limited to those associated with bauxite production. The impact of discriminatory taxation on the cost of the other materials listed above is not significant.

On the basis of discussions with industry sources, it was assumed that aluminum scrap would be converted to secondary ingot essentially on a ton for ton basis.

(2) Dollar Tax Impacts Per Ton of Bauxite Produced Were Computed for the Years 1970-1972

The dollar impact of each element of taxation on the cost per ton of bauxite mined was computed for each primary producer evaluated. Separate estimates were prepared for each year over the period 1970 - 1972. Analytical procedures used were as follows:

- Depletion Tax Benefits

  The procedures used in estimating unit depletion tax benefits were as follows:

  - Annual bauxite production quantities were obtained from published producer statistics. Adjustments were made where required to eliminate purchased bauxite from aggregate statistics.
  - The amount of cost depletion claimed annually by each producer was estimated on the basis of depletion entries on SEC Form 10K.
  - Percentage depletion was computed by applying the allowable percentage depletion rate for bauxite to the quantity of bauxite mined by each producer in a given year times a cut off price per ton of bauxite supplied by an industry source. Computations were based primarily upon foreign source bauxite as domestic bauxite production is only 10% of the total.

- The excess of percentage over cost depletion was obtained by subtracting estimated cost depletion from estimated percentage depletion.

- The net tax benefit was derived by multiplying the excess of percentage depletion over cost by 0.48.

- To evaluate the impact of the 50 percent limination on percentage depletion (see Chapter II) which would not be reflected in the above computations, a separate estimate of the reduction in each producer's tax liability attributable to depletion was developed using a process of elimination. Essentially, reductions in taxes payable attributable to all non-depletion items including accelerated depreciation, foreign tax credits, the investment credit and other items were estimated with the balance considered to be attributable to depletion. Data sources included SEC filings, notes to financial statements, supplemented in some cases by data made available by producers.

- Estimated tax benefits derived using both above methods were compared and the lesser indicated benefit was used for subsequent analysis. The lesser indicated benefit was used to reflect the operation of the 50 percent depletion limitation where possible. If the first above procedure produced the lesser indicated benefit, then the 50% percent limitation would not be reflected. If the second procedure used (process of elimination) produced the lesser indicated benefit, the difference in benefits was assumed to approximate the impact on benefits of the 50 percent limitation. Care was taken not to overestimate the magnitude of non-depletion items therefore weighting the analysis toward understating rather than overstating the reduction in benefits imposed by the 50 percent limitation.

As indicated above, the estimating procedures may be expected to overstate rather than understate the tax benefit associated with the percentage depletion allowance.

- Foreign Tax Credits

The procedures used in estimating tax benefits derived from foreign tax credits were as follows:

- Foreign revenue from bauxite production was estimated by applying average bauxite prices, provided by industry sources, to bauxite production. Pre tax profits were estimated to be equal to 11 percent of revenue on the basis of published data (Fortunes 500) regarding the profitability of foreign mining operations.

- Foreign taxes paid were computed by applying a 30 percent tax rate to estimated pre-tax profits. The tax rate used is that prevailing in major bauxite producing countries.

- The full amount of foreign taxes paid was assumed to be creditable against U. S. taxes. The tax benefit associated with the foreign tax credit was computed as 48 percent of the foreign taxes paid. This procedure assumes that tax benefits can be maximized.

- Western Hemisphere Trade Corporations (WHTC)

WHTC tax benefits were computed as follows:

- U. S. tax liabilities without the WHTC option and prior to the application of the foreign tax credit were computed as 48 percent of pre-tax income from bauxite mining.

- The WHTC option reduces the U. S. tax liability by 34 percent. Thus the WHTC tax benefit was computed as 34 percent of the U. S. tax liability estimated above (before application of the foreign tax credit).

The procedures used in estimating WHTC and foreign tax credit benefits are based upon the assumption that maximum advantage can be taken of both benefits. The tax code states that the foreign tax credit which which may be taken by a WHTC is limited to the effective WHTC tax rate which is 34 percent. Since the foreign tax rate assumed is 30 percent, this limitation would not affect the computations.

- Tax Treatment of Exploration and Development Costs

  Benefits associated with the expensing of mine exploration and development costs were estimated primarily from analysis of expense accounts on producer financial statements. Adjustments were made where required to isolate development expenses attributable to mining activities. The basis for estimating the tax benefit in each year was computed as the net reduction in the current years tax liability achieved through treating such costs as expenses rather than capital investments. The dollar value of the tax benefits was considered to be the time value of the deferred tax liability discounted at 6.5 percent over an average period of 12.5 years. The discount rate used reflects a conservative estimate of cost borrowing while the cutoff point (12.5 years) reflects an estimated amortization period, were costs capitalized.

- State Taxes

  The impact of state taxes on production costs was estimated by applying Arkansas state tax rates ($0.15 per ton of bauxite.)

The estimating procedures described above may be considered conservative in that they are weighted against understating benefits.

4. PERCENTAGE DEPLETION, FOREIGN TAX TREATMENT, AND THE TAX TREATMENT OF EXPLORATION AND DEVELOPMENT EXPENSES HAVE NEARLY EQUAL IMPACTS ON THE COST OF PRIMARY ALUMINUM PRODUCTION

The impacts of applicable taxes and tax benefits on the cost of producing bauxite and primary aluminum ingot for the period 1970-1972 are shown on Exhibit XII, following this page. The estimates shown cover approximately 70 percent of U. S. owned bauxite shipments, and consequently may be expected to be generally representative of industry operations.

The table below summarizes the estimated net after tax reduction in the cost of producing aluminum ingot in 1972 attributable to discriminatory taxes and tax benefits, assuming 4.0 tons of bauxite ore are required per ton of aluminum ingot.

	Per Ton Basis	
	$	%
Depletion	$1.35	35.5
Foreign tax credit	0.78	20.5
WHTC	0.73	19.2
Exploration and development expenses	1.02	26.8
State Taxes	(0.08)	(2.0)
Total	$3.80	100.0

As indicated, percentage depletion is the largest single item contributing to cost reduction, although foreign tax regulations and exploration and development cost tax treatment combined account for about 67 percent of total cost reduction. The impact of state taxes as might be expected is negligible.

The largest computed net tax benefit, $4.36 per ingot ton in 1970, would be equal to about 0.9 percent of the current price of aluminum ingot ($500 per ton). On a pretax basis the net tax benefit would be $8.72 per ton, equal to about 1.8 percent of the price of aluminum ingot.

EXHIBIT XII

IMPACT OF SELECTED TAXES AND TAX BENEFITS ON THE COST OF PRODUCING PRIMARY ALUMINUM INGOT 1970-1972 *

U.S. TAX TREATMENT	DOLLARS PER TON & PERCENT OF PRICE ①											
	BAUXITE						ALUMINUM INGOT ②					
	1972		1971		1970		1972		1971		1970	
	$	%	$	%	$	%	$	%	$	%	$	%
DEPLETION	0.337	2.4-3.4	0.264	1.8-2.6	0.360	2.5-3.6	1.21-1.35	LESS THAN 1	0.95-1.05	LESS THAN 1	1.30-1.44	LESS THAN 1
TAXES PAID OR DEEMED PAID TO FOREIGN GOVERNMENT	0.195	1.4-2.0	0.195	1.4-2.0	0.191	1.4-1.9	0.70-0.78	LESS THAN 1	0.70-0.78	LESS THAN 1	0.69-0.76	LESS THAN 1
WESTERN HEMISPHERE TRADE CORPORATIONS (WHTC)	0.182	1.3-1.8	0.182	1.3-1.8	0.179	1.3-1.8	0.66-0.73	LESS THAN 1	0.66-0.73	LESS THAN 1	0.64-0.72	LESS THAN 1
EXPLORATION AND DEVELOPMENT EXPENSES	0.254	1.8-2.5	0.280	2.0-2.8	0.380	2.7-3.8	0.91-1.02	LESS THAN 1	1.00-1.12	LESS THAN 1	1.36-1.52	LESS THAN 1
STATE TAXES	(0.020)	0.1-0.2	(0.020)	0.1-0.2	(0.020)	0.1-0.2	(0.07-0.08)	LESS THAN 1	(0.07-0.08)	LESS THAN 1	(0.07-0.08)	LESS THAN 1
	$	%	$	%	$	%	$	%	$	%	$	%
TOTAL IMPACT ③ ④	.948	6.8-9.5	.901	6.4-9.0	1.090	7.8-10.9	3.41-3.80	LESS THAN 1	3.24-3.60	LESS THAN 1	3.92-4.36	LESS THAN 1

① PRICE DATA FOR BAUXITE AND ALUMINUM INGOT

BAUXITE: 1970 – $10-$14 LONG DRY TON
1971 – $10-$14 LONG DRY TON
1972 – $10-$14 LONG DRY TON

COMPANIES RESPONDING SHOWED AN AVERAGE PRICE OF $13.00 IN 1972, $13.00 IN 1971 AND $12.80 IN 1970. THE $10-$14 FIGURE COVERS A LARGER PERCENTAGE OF PRODUCTION.

ALUMINUM INGOT: 1972: $0.26 LB.
1971: $0.25 LB.
1970: $0.27 LB.

③ TOTAL IMPACT DOES NOT INCLUDE SIMILAR BENEFITS THAT MAY BE DERIVED FROM CARBON, CRYOLITE OR ALUMINUM FLUORIDE. SUCH BENEFITS ARE NOT MATERIAL.

④ BENEFITS ASSOCIATED WITH THE EXCLUSION OF GROSS UP ON DIVIDENDS OF LESS DEVELOPED COUNTRY CORPORATIONS, AND WITH THE EXCLUSION OF CONTROLLED FOREIGN SUBSIDIARIES WERE NOT FOUND TO BE MATERIAL.

② MATERIAL REQUIREMENTS FOR ONE TON OF ALUMINUM INGOT

3.6 – 4.0	TONS OF BAUXITE
.6	TONS OF BAKED CARBON
.03	TONS OF CRYOLITE
.04	TONS OF ALUMINUM FLUORIDE

* Note: Impacts are shown on an after tax basis

APPROXIMATELY 70% OF U.S.-OWNED BAUXITE SHIPMENTS ARE COVERED IN THIS EXHIBIT

NOTE: WHILE DATA USED IN THESE EXHIBITS WERE OBTAINED FROM RELIABLE SOURCES, THE SCOPE OF THE BOOZ, ALLEN ASSIGNMENT DID NOT INCLUDE AN AUDIT OR INDEPENDENT VERIFICATION OF THESE DATA

5. THE INFLUENCE OF DIFFERENTIAL TAXATION ON RAW MATERIALS USE MUST BE EVALUATED IN LIGHT OF INDUSTRY CHARACTERISTICS AND THE CURRENT INDUSTRY SITUATION

As indicated previously in this chapter, the technology of primary aluminum production limits the substitution of aluminum scrap for primary raw materials in the primary aluminum production process. In the marketplace, however, secondary aluminum may be substituted for primary aluminum. Approximately 20 percent of the aluminum consumed by the casting industry, the major consumer of secondary aluminum, is supplied by primary producers. This market, which in total is equal to about 13 percent of secondary production, provides the greatest potential for increasing secondary producers' share of total output.

Lesser potential exists, in the near term at least, for substituting secondary aluminum in uses traditionally limited to primary aluminum. The primary barrier to substitution, other than availability, is provided by the fact that the alloy content and purity of primary aluminum required for many uses cannot economically be duplicated in secondary aluminum production. Nevertheless, some substitutability undoubtedly does exist although its extent has not been investigated within the scope of this study.

(1) There Are Several Factors Currently Favorable to Prospects for Expanded Secondary Aluminum Production

There are several elements of the current economic and energy situations which appear to be favorable to expanded secondary aluminum production:

- Primary aluminum processes are highly energy intensive which make both current output and new capacity sensitive to energy shortages and costs.
  - 25 percent or more of primary aluminum ingot costs are accounted for by electrical energy

  - Significant expansion of domestic aluminum production will require concurrent availability of electric power generating capacity
  - Primary aluminum output has recently been adversely affected by electric power shortages, especially in the Pacific Northwest

- Secondary aluminum production, on a per unit basis, requires less than 10 percent of the energy consumed in primary production.
- At the present time, worldwide aluminum capacity, with some energy constrained exceptions, is virtually fully in use. Capacity must be expanded in the near term. Secondary capacity, on an equivalent tonnage basis, requires slightly more than 10 percent of the capital required for primary capacity and can be developed more rapidly.
- The Arab oil embargo has fostered concern regarding the potential export policies of bauxite and alumina exporting countries most of which are in the LDC category. While no overt actions have been taken, the possibility of action raises a new element of risk regarding the accessibility and cost of raw materials.

These factors may be viewed both singly and in combination as favorable to an expanded role for secondary aluminum production.

(2) Both Price Levels and Price Stability Will Affect Prospects for the Increased Use of Aluminum Scrap

At the present time, available prompt industrial aluminum scrap is virtually fully committed, either to domestic or export markets. Thus, the only source of additional market supplies is post-consumer waste. This scrap component is the most costly to use due to the costs associated with scrap separation, concentration and transportation. The extent to which the market supply of scrap from this source will expand is a function of the price of scrap and price stability.

The current aluminum scrap and secondary aluminum price situation is peculiar as domestic secondary aluminum producers are faced with a shortage of scrap. This situation has resulted from the following influences:

- Worldwide aluminum prices, reflecting surging demand, have increased by more than 50 percent over 1972 levels. This magnitude of increase has been applicable to both primary and secondary aluminum.
- Domestic primary and secondary aluminum prices, which are controlled, are currently about 20 percent lower than world prices.
- Aluminum scrap prices move very closely with secondary aluminum prices. As a consequence, export scrap demand has caused scrap prices which are not controlled to increase to the point where domestic secondary producers cannot profitably compete for incremental scrap supplies.

Were price controls on aluminum to be removed, domestic aluminum prices would undoubtedly adjust to eliminate this situation. At the present time, the situation can be described as positive from the point of view of expansion of the market supply of scrap but negative in terms of domestic secondary producer market access and capacity expansion. Assuming that aluminum prices are decontrolled, however, the outlook for increased secondary aluminum production should be favorable.

The volitility of the price of aluminum scrap presents a risk related barrier to the investment in collection and separation equipment needed to increase the market supply of old aluminum scrap in the long run. The degree of price volitility can be seen in the behavior of the price of aluminum clippings between 1969 and 1971. In 1969, with strong demand, prices reached $295 per ton while, by the end of 1971, reflecting slack demand, prices had decreased by $145 per ton or 50 percent. Similar volitility in terms of price increases has been demonstrated during the recent demand surge. A large component of the volitility of aluminum scrap prices is directly attributable to the volitility of aluminum ingot prices on world markets. Thus, a sharp change in the quantity of aluminum demanded in the marketplace will be reflected in aluminum prices and in turn in scrap prices. As a consequence, stabilization of scrap prices would require stabilization of aluminum capacity and demand relationships into a reasonably predictable pattern, something which has never been achieved. At the present time, demand for aluminum has exceeded or is on the verge of exceeding worldwide production capacity. A cyclical downturn in future demand could, however, send prices into a downward spiral.

Significant expansion of secondary production in the long run, then, may require that some mechanism be developed to accommodate the risks associated with scrap price instability. One such mechanism could be developed through the establishment of municipal reclamation centers which would provide aluminum scrap to dealers at adjustable prices designed to provide them with a reasonable profit in the face of fluctuating market prices. The feasibility of this type of arrangement would depend, of course, on the expected net cost to municipalities or regional governments in relation to the costs of other disposal alternatives such as land fill. The basis for such an arrangement would involve internalizing disposal costs not now reflected in the cost and price of scrap.

Stabilizing the market supply of post consumer aluminum scrap and internalizing disposal costs, which may permit the base market price of scrap to be reduced, could provide the basis for increasing the share of aluminum output by secondary producers. This is applicable both to general scrap and aluminum cans.

Whether such an arrangement is practical will depend, as indicated above, on the relative net cost of reclamation as opposed to alternative disposal options.

7. TAX TREATMENT EQUALIZATION MAY HAVE SOME MARGINAL IMPACT ON RELATIVE USE OF ALUMINUM SCRAP

If the tax treatment of primary and secondary materials is equalized by providing equivalent benefits to scrap processors, the aluminum scrap supply curve will shift but the shape of the supply curve will not be altered. The degree to which the supply curve shifts, as well as its shape, will determine the amount of additional scrap to be placed on the market at any given price. The greater the slope of the supply curve, the larger will be the incremental market supply of scrap.

The relatively small changes in the market supply of scrap accompanying very large changes in price suggests that the short run supply curve is relatively flat (i.e., supply is relatively inelastic to price) and that, consequently, only marginal changes in the market supply of scrap would result from tax treatment equalization.

Of more importance, however, is the shape of the long run scrap supply curve. The shape of this curve is not known; however, the following observations are possible:

- The shape of the supply curve will depend in the long run on marginal cost of scrap, which will include a risk component related to price instability.
- Tax treatment equalization, because scrap price instability is related to product demand patterns, will have at best a marginal price stabilizing influence.
- If the long run marginal cost of scrap includes a substantial risk component, it is likely that the long run supply curve would be flat and the supply impact of tax equalization marginal. If, on the other hand, the municipal reclamation program were adopted, the risk would be minimized and the slope of the long run supply curve steepened which would cause tax equalization or any reduction in net cost to have a greater impact on market supplies.
- The long run marginal cost of scrap, exclusive of risk, is also of paramount importance in assessing impacts. The magnitude of such costs in relation to the benefits provided by tax equalization will be a key determinant of changes in the market supply of scrap. Such costs are not, however, known.

The short and the long run demand curves for scrap must also be considered in evaluating the impact of tax equalization. The shape and location of the short-run scrap demand curve is determined by the short run demand curve for secondary aluminum ingot, but becomes vertical when the point on the curve is reached which represents limits of current secondary aluminum smelter and remelt furnace capacity. At the present time, as noted above, price controls have created a domestic scrap shortage. In a free market, however, it is probable that secondary smelters would be operating at close to capacity thus allowing for minimal, if any, short run impact of tax equalization.

The long run demand curve for aluminum scrap is dominated by several elements:

- The long run aluminum ingot demand curve
- The relative cost of scrap vs. primary raw materials
- The substitutability of scrap for primary materials in end product applications

An increase in the cost of virgin materials relative to secondary materials would cause the demand curve to shift to the right thus theoretically increasing the quantity of scrap demanded at any given price. The extent of the shift will be controlled by the relative change in the cost of scrap vs. secondary materials and the degree that scrap may be substituted for primary materials in end uses. The degree of substitutability is limited given the present state of the art, as has been pointed out previously. In the long run, however, technological change may permit increased substitutions.

In the short run, then, the impact on scrap demand of any tax equalization action which increases the cost of virgin raw material is likely to be minimal. The long run consequences of such an action will depend on aluminum ingot demand as well as cost and technological factors described above which cannot be evaluated within the scope of this study.

The impact of tax equalization on scrap consumption both in the short and the long run depends on both the supply and demand factors discussed above.

* * *

The following chapter addresses the impact of discriminatory taxation on the pulp and paper industry.

IV. THE PULP AND PAPER INDUSTRY

This chapter addresses the impact of discriminatory taxes and tax benefits on the relative use of virgin and secondary materials in the pulp and paper industry.

1. PULP AND PAPER PRODUCTS MADE FROM VIRGIN AND SECONDARY MATERIALS COMPETE IN THE MARKET PLACE

Pulp and paper products made from virgin and secondary materials are substitutable for the most part in the market place. Accordingly, the point at which virgin and secondary materials are subject to substitution is in the final product stage (e.g., combination box board is a substitute for folding box board produced from virgin materials) for purposes of this analysis. It should be pointed out, however, that secondary fibre may be substituted for virgin fibre to a limited degree during processing.

The specific pulp and paper products selected for analysis in this study were newsprint and paperboard (folding box board). Both of these products are produced from virgin and secondary materials and compete in the market place. Although the specific properties of products produced from virgin and secondary materials differ, in some cases significantly, they are mutually substitutable in many end uses.

2. CAPITAL GAINS TREATMENT OF TIMBER PROFITS IS THE BASIS FOR DISCRIMINATORY TAXATION IN THE PRODUCTION OF PULP AND PAPER

As discussed in Chapter II, timber operators are allowed to treat profits from the cutting and sale of timber as capital gains. This option, which is not available to secondary fibre collectors and dealers, effectively reduced the net cost of harvesting timber for use in the manufacture of pulp and paper. The net cost reduction or tax benefit associated with the capital gains option is measured as the net reduction in a timber operators tax liability in comparison with the tax liability had timber harvesting profits been treated as ordinary income.

There are special state and local taxes applicable to timber lands which are not assessed at any stage of secondary fibre collection and use. Because of the diverse nature of these taxes, some of which provide incentives, some disincentives, no attempt was made to quantify them. The analysis of discriminatory taxation in the production of pulp and paper is focused entirely on the capital gains option.

3. THE IMPACT OF THE CAPITAL GAINS OPTION WAS COMPUTED FOR THE MANUFACTURE OF NEWSPRINT AND PAPERBOARD

The impact of the capital gains option on unit output costs was computed at the following pulp and paper processing stages:

- Roundwood - timber after harvesting
- Groundwood pulp and newsprint
- Chemical woodpulp and paperboard

Timber operations of pulp and paper producers accounting for approximately 56 percent of domestic production were analyzed for the period 1970-1972. The analytical data base used was primarily that provided by producer published financial and statistical data and copies of Form 10 K on file with the Securities and Exchange Commission. Data available in the public files of the Internal Revenue Service proved to be of limited value due to the level of data aggregation. Individual company tax returns could not be and were not reviewed.

Producers contacted were unwilling to make available specific information beyond that available publicly. Producers did, however, provide assistance in interpreting data published by them, in confirming the validity and reasonableness of data adjustments made, in quantifying materials conversion ratios (quantities of raw materials required to produce a final product) and in providing independent confirmation of product price levels.

(1) Raw Materials Conversion Ratios Were Developed for Newsprint and Paperboard Manufacturing

To provide a basis for assessing the capital gains benefit on a unit of output basis at each major production step, the following materials conversion ratios were used:

Product	Input	Output
Groundwood Pulp	1.0 cords* Roundwood	1.0 tons Groundwood Pulp
Chemical Woodpulp	1.6 cords Roundwood	1.0 tons Chemical Woodpulp
Newsprint	1.0 tons Groundwood Pulp	1.0 tons Newsprint
Folding Boxboard	1.0 tons Chemical Woodpulp	1.0 tons Folding Boxboard

* One cord equals approximately 1.2 tons

** Newsprint normally is produced using 75-80% groundwood and 20-25% semi bleached chemical fiber; however, the ratio of 1.1 is sufficiently accurate for this analysis.

Detailed process flow diagrams for manufacturing newsprint and paperboard are provided in Appendix A to this report.

(2) Dollar Capital Gains Benefits Per Unit of Timber Harvested Were Computed for the Years 1970 - 1973

Capital gains benefits per unit of timber harvested were computed for those producers included in the study. Data regarding specific timber plots or the ultimate usage of specific timber harvested, were not available. Accordingly, it was necessary to use aggregate annual data regarding timber harvested for each producer analyzed.

Similarly, producers contacted were unwilling to make capital gains data available regarding specific timber lands and were unable because of the multiple uses of timber cut in a given location to provide capital gains data relating to timber harvested for use specifically in manufacturing pulp and paper. Because of these data limitations, it was necessary to make use of aggregate capital gains data covering all timber operations.

To isolate capital gains applicable to timber operations, those components of total capital gains for each producer analyzed, which were allocable to non-timber operations (real estate, securities investment, special items, etc.) were identified and appropriate adjustments made. Producers contacted during the study were particularly helpful in confirming the reasonableness of these adjustments.

The tax benefit associated with the capital gains option was estimated by computing the tax liability for capital gains at the 30 percent capital gains rate and the 48 percent corporate rate for ordinary income. The difference in the tax liabilities so derived was considered to be the measure of the capital gains tax benefit. The aggregate annual capital gains benefit computed for each producer analyzed was divided by the total amount of timber harvested to provide an estimate of the capital gains benefit on a per unit basis.

(3) The Impact of Capital Gains Benefits Was Estimated at Each Major Production Stage for Newsprint and Paperboard

The raw materials conversion ratios discussed above were applied to the capital gains benefits computed for harvested timber to provide an estimate of the value of such benefits in relation to the following intermediate and final products:

- Unbleached groundwood pulp
- Chemical woodpulp
- Newsprint
- Folding boxboard

The values of the capital gains benefits have been computed in terms of dollars per ton and as a percentage of the prevailing prices of the above products. Dollar benefits and the relationship of benefits to prevailing prices in each case are displayed as a low-high range with the limits of the range defined as follows:

- The low end of the range represents the lowest per unit benefit computed in each year among the producers analyzed as applied to the highest price shown for the product of interest
- The high end of the range represents the largest per unit benefit computed among the producers analysed applied to the lowest price shown for the product of interest

(4) The Methodology Used in Computing Capital Gains Benefits and the Available Data Base Have Limitations Which Must Be Recognized

As discussed above, capital gains benefits per unit of timber harvested were computed on the basis of all timber harvested by the producers analyzed. Thus, the benefits derived represent an average of benefits derived from timber cut for all uses including lumber. Because trees cut for lumber are normally several years older than those cut for pulp and paper and have a higher value, it is probable that the estimates of capital gains benefits derived overstate to some extent the benefits applicable to wood used in producing pulp and paper.

The capital gains benefits computed for timber harvested during 1971 are effectively reduced by capital losses claimed during that year resulting from various circumstances including losses on real estate operations. Available data, including that gathered by direct producer contacts, did not permit adjustments for capital losses on non-timber operations to be made. Accordingly, indicated 1971 capital gains benefits should not be regarded as representative of normal operations. Producer contacts did confirm, however, that the impact of capital losses would have no material effect on benefits computed for timber harvested during 1970 and 1972.

4. THE IMPACT OF CAPITAL GAINS TAX BENEFITS VARIES DEPENDING ON THE GRADE AND QUALITY OF THE FINAL PRODUCT AND THE DOLLAR VALUE OF COMPUTED CAPITAL GAINS

Exhibit XIII, following this page, contains estimates of capital gains tax benefits for the years 1970 - 1972.

As indicated on the Exhibit the magnitude of computed tax benefits in relation to product prices varies widely. The table below summarizes the magnitude of capital gains benefits in relation to pulp and paper product prices for the years 1970 and 1972:

	After Tax Benefit as % of Price	
	1970 (%)	1972 (%)
Groundwood Pulp	0.8 - 2.2	0.6 - 1.6
Chemical Pulp	0.8 - 1.8	0.6 - 1.1
Newsprint	0.5 - 1.0	*
Folding Boxboard and Paperboard	0.7 - 2.4	0.5 - 1.6

Figures for 1971 have not been included in the table as the effect of capital losses, discussed above, make them non-representative. The variations in the magnitude of benefits shown result from two factors:

- Differences in computed tax benefits
- Differences in product prices

Differences in product prices are most significant for paperboard. Depending on product grade and quality, the price of paperboard may vary by as much as $60 per ton (1972). For the other products analyzed, the primary differential in the magnitude of capital gains benefits in relation to price is caused by the range of the dollar values of computed capital gains.

It should be noted that the relationships shown on Exhibit XIII and the above table have been developed on an after tax basis. Thus, if capital gains benefits were removed, producers at each stage of production, assuming no substitution, would require price increases of approximately double the amounts and percentages

EXHIBIT XIII

IMPACT OF SELECTED TAXES AND TAX BENEFITS ON THE COST OF PRODUCING PULP AND PAPER 1970-1972

DOLLARS PER TON AND PERCENT OF PRICE

	U. S. Tax Treatment	Roundwood ($ per Cord)		Unbleached Groundwood Pulp (1) (2)			Newsprint (1)			Chemical Woodpulp (1)(3)			Folding Boxboard and Paperboard		
		$ High	$ Low	$ High	$ Low	% % Range	$ High	$ Low	% % Range	$ High	$ Low	% % Range	$ High	$ Low	% % Range
1972	Capital Gains	1.14	0.54	1.14	0.54	0.6 - 1.6	1.14	0.54	Less than 1	1.82	0.86	0.6 - 1.1	1.82	0.86	0.5 - 1.6
	Total Impact	1.14	0.54	1.14	0.54	0.6 - 1.6	1.14	0.54	Less than 1	1.82	0.86	0.6 - 1.1	1.82	0.86	0.5 - 1.6
1971	Capital Gains	0.32	0.15	0.32	0.15	Less than 1			Less than 1	0.51	0.24	Less than 1	0.51	0.24	Less than 1
	Total Impact	0.32	0.15	0.32	0.15	Less than 1	0.32	0.15	Less than 1	0.51	0.24	Less than 1	0.51	0.24	Less than 1
1970	Capital Gains	1.55	0.73	1.55	0.73	0.8 - 2.2	1.55	0.73	0.5 - 1.0	2.48	1.17	0.8 - 1.8	2.48	1.17	0.7 - 2.4
	Total Impact	1.55	0.73	1.55	0.73	0.8 - 2.2	1.55	0.73	0.5 - 1.0	2.48	1.17	0.8 - 1.8	2.48	1.17	0.7 - 2.4

		Price Per Ton		
		1972	1971	1970
(1)	Groundwood Pulp (unbleached)	72 - 88	72 - 88	72 - 88
	Newsprint	164	154	151
	Groundwood Pulp (bleached)	91 -102	80 -100	80 -100
	Chemical pulp (including sulfate, sulfite, bleached, unbleached, or semi-bleached	145-164	145-165	139-162
	Paperboard including folding box board	115-175	108-174	105-168

Note: Price depends upon quality and location

(2) Material requirement for groundwood pulp used for newsprint 1.0 cords of pulpwood for 1.0 tons of groundwood pulp

(3) Material requirements and yield factors for one ton of chemical pulp used for kraft vary depending on a variety of factors. This exhibit assumes 1.6 cords of roundwood. Also required: waste papers and other fibers, sulfur, chlorine, sodium hydroxide, sodium sulfate, lime and other chemicals

This exhibit covers approximately 56% of total paper produced in the U.S.

(4) The data for 1971 reflect investment losses which effectively reduced capital gains from timber operations.

Note: While data were obtained from reliable sources, the scope of the Booz, Allen assignment did not include an audit or independent verification of these data.

Note: Impacts are shown on an after-tax basis shown to restore after tax profits to levels achieved with capital gains benefits in force. For the lowest priced paperboard indicated, for example, price increases of $3.64 per ton or 3.2 percent would be required to bring after tax profits up to achieved 1972 levels, in the absence of capital gains benefits. A price increase of only one percent for high value paperboard products would be required to restore 1972 profits to levels actually achieved. This assumes, of course, that increased net costs are passed through all production stages to the consumer.

The probable effect of capital gains benefits on pulp and paper processors' raw materials choices is discussed below.

5. THE IMPACT OF TAX TREATMENT EQUALIZATION ON RAW MATERIALS CHOICES WILL DEPEND ON SEVERAL SHORT AND LONG RUN VARIABLES WHICH INFLUENCE RELATIVE COSTS

The influence of capital gains benefits on pulp and paper producers' decisions to use virgin raw materials as opposed to secondary raw materials must be considered in the light of basic production economics and the current industry situation. These factors are discussed in detail below.

(1) Demand for Pulp and Paper Products is Balanced With Production Capacity

During the 1960's, capacity to produce pulp, paper, and paperboard chronically exceeded demand, leading to low prices, underutilized capacity, and low producer rates of return on investment. During 1971, industry profitability was at its lowest point since 1938, with profits averaging 2.3% of sales and returns on stockholders equity averaging 4.8%. In 1972, reflecting sharply increased demand and firmer prices, profit margins increased to about 3.8% of sales, and return on stockholders equity rose to about 8.5%.

At the present time, demand in almost all product classifications is becoming balanced with production capacity with producer backlogs increasing monthly. This situation is expected to continue, at least for the next few years, because additional production capacity is not being installed at a rate sufficient to meet anticipated demand. This lack of capacity development results from the following factors:

- Return on investment, including that for 1972, has not been sufficient to justify new capacity.
- Significant investments--an estimated $1.6 billion for the 1971-74 period are currently being undertaken for pollution control. At the present time, the ability of the industry to attract significant additional capital for capacity expansion is limited.
- Producers, in light of the experience of the 1960's, are reviewing capacity expansion plans with great caution to avoid the development of future excess capacity problems.
- Major capacity additions take about three years to bring on stream. Thus commitments to expansion made currently will not have any near-term impact on output.

Given current and anticipated capacity and demand relationships and the absence of price controls, it is probable that rates of return will increase to a point that would make new capacity attractive. Capital requirements for pollution control will probably remain a factor, however, limiting capacity expansion into 1978, since development of 1978 capacity must begin by 1975--in less than two years.

Current indications are that capacity will expand by about 3% per year through 1975 which provides some margin for potential growth in wastepaper usage.

(2) Despite Logistical Barriers, Use of Secondary Fibres in Existing Pulp and Paper Plants Appears to Be Increasing

Pulp and paper plants currently in existence are located primarily in rural areas, in proximity to virgin material sources of supply. The rural location of these plants puts them far from large waste paper sources which are in large densely populated urban areas creating logistical and cost barriers to the maintenance of a steady flow of secondary fibres.

Wastepaper originating in the converting segment of the paper and paperboard industry is virtually 100% recovered at the present time. The recovery rate from commercial as opposed to manufacturing sources (primarily used boxes and cartons) although not known with precision has potential for increase.

The largest potential source of wastepaper recovery is municipal waste. The logistics of collecting and separating waste in sufficient quantities to make recovery economical in the past minimized recovery increases. Ongoing activities for recovery of such waste have taken place in the production of secondary newsprint and corrugated boxes in locations where available supplies are sufficient to make secondary materials use economical.

The potential for increased usage of secondary fibres from commercial sources is not known with precision at this time. The general practice currently prevailing is for users of boxes and cartons to contract for disposal with private collectors who normally do not attempt any recycling. While the logistical barriers discussed above would apply in a somewhat more limited sense to the increased use of secondary fibres from commercial sources, there are encouraging signs. The American Paper Institute has estimated that the use of old corrugated boxes may increase by as much as 34% over the next three years.

Recent developments indicate that the use of secondary fibres in existing plants is increasing, although the extent of the increase is not clear. Two major factors appear to account for this increase:

- A developing shortage of virgin fibres related not to a shortage of wood, but to difficulties and costs of obtaining labor for lumbering operations.

- **The lower capital costs and shorter lead times required to expand secondary production.**

- **The energy shortage, which has made secondary fibres more attractive as their use appears to require less energy than do virgin fibres.**

In essence, the above factors appear in combination to have altered the relative cost of using virgin and secondary materials in some applications, especially paperboard manufacturing. The extent of the substitution will depend ultimately on the incremental costs of obtaining additional volumes of wastepaper in relation to the increased cost of obtaining and using virgin fibres.

(3) The Market Supply of Secondary Fibres Appears to Be Relatively Insensitive to Price in the Short Term

The quantity of wastepaper generated from all sources in any given time period is directly related to the quantity of paper produced in that period. Paper and paperboard are non-durable products, thus the opportunity to recycle waste from prior years' production, as for example, with metal scrap, does not exist. In periods of rapidly increasing paper output, therefore, prices for wastepaper tend to increase sharply, as supplies from accessable industrial and commercial sources tend to lag demand. Conversely, when output growth tails off, wastepaper prices tend to decline sharply in the face of excess market supplies. Since only a relatively small proportion of the wastepaper entering the solid waste is recycled, wastepaper price behavior in the face of relatively small changes in consumption suggests that the short run marginal cost of recycling additional proportions of the wastepaper supply is high. This is supported by the fact that additional recycling would require use of wastepaper from the commercial and post consumer waste streams which, as indicated previously, are higher cost sources.

Exhibit XIV, following this page, compares consumption and price behavior for wood pulp and wastepaper. The volitility of wastepaper prices, reflecting the factors discussed above is clearly evident. From 1969 to 1971, wastepaper prices declined by 19.3% reflecting sluggish paper demand. As paper demand grew rapidly in 1972, wastepaper prices increased by 19.7%.

Reported wood pulp prices on the other hand have demonstrated significant historical stability which indicates that market supplies have been significantly more responsive to demand than is the case

EXHIBIT XIV

WOOD PULP AND WASTEPAPER CONSUMPTION AND PRICE INDICES
1964 - 1972

Year	Wood Pulp Consumption		Wood Pulp Prices		Wastepaper Consumption		Wastepaper Price	
	Index	% Change From Prior Year	Index	% Change From Prior Year	Index	% Change From Prior Year	Index	% Change From Prior Year
1972	126.2	+ 5.6	111.1	-1.0	115.8	+2.4	133.9	+19.7
1971	119.5	+ 2.3	112.0	+2.3	113.1	+2.5	111.9	-10.4
1970	116.8	- 1.8	109.5	+9.5	110.3	0.0	124.9	- 9.4
1969	118.9	+ 6.5	100.0	0.0	110.3	+6.4	138.7	+ 6.7
1968	111.6	+11.6	100.0	0.0	103.7	+3.7	130.0	+30.0
1967	100.0	+ 0.3	100.0	0.0	100.0	+1.0	100.0	-25.6
1966	99.7	+ 8.5	100.0	-0.1	99.1	+4.0	134.4	+ 5.6
1965	91.9	+ 5.9	100.1	+2.0	95.3	+4.0	127.3	+ 7.6
1964	86.8	N/A	98.1	N/A	91.6	N/A	118.3	N/A

Source: Consumption indices computed from American Paper Institute data

Price indices--Bureau of Labor Statistics, Wholesale Price Index with wastepaper both in the short and the long run. As indicated previously, however, a shortage of wood pulp has developed due to labor and energy factors. It is too early to judge, however, whether the factors causing the shortage are of a temporary or a long term nature.

The volatile nature of wastepaper prices is further demonstrated by the range of price fluctuation within given years as indicated on Exhibits XV and XVI following this page. The pattern of fluctuations tends to highlight the short term market supply rigidity discussed above.

In the short run (1-2 years), therefore, it is probable that tax treatment equalization would cause secondary fibre use to increase only marginally, if at all.

(4) The Long Run Responsiveness of the Market Supply of Wastepaper to Cost/Price Changes Depends on Several Indeterminate Factors

If the cost of making wastepaper available in the market place were to decrease, the quantity offered for sale at any price should increase over the long run. Similarly, if the cost of using virgin fibre were to increase relative to the cost of using secondary fibre, the price producers would be willing to pay for any given quantity of wastepaper should increase proportionately. The magnitude of demand and or market supply expansion will depend both on the change in relative cost/price relationships, the long run marginal cost of recycling additional wastepaper and the degree to which available technology permits the substitution of wastepaper for virgin fibre.

As is the case with all scrap, the long run marginal cost of recycling additional wastepaper probably has a significant risk component related to market instability. The development of municipal or regional reclamation, as discussed in Chapter III could provide a means of risk accommodation. This, in turn, could reduce the marginal cost of recycling causing the market supply of wastepaper to become more responsive to price. Other elements of marginal cost are also major determinants of the long run wastepaper supply function. Such costs, however, are indeterminate at this time.

EXHIBIT XV

YEARLY PRICE CHANGES FOR NO. 1 WASTE NEWSPRINT
1968 - 1973
(dollars per ton)

Year	Low Price	High Price	Price Changes (Low-High)
1973	$17.00	$26.00	$ 9.00
1972	17.80	21.50	3.70
1971	16.30	20.59	4.29
1970	16.69	19.89	3.20
1969	18.90	23.20	4.30
1968	19.81	24.89	5.08

Source: Derived from data supplied by the
Bureau of Labor Statistics

EXHIBIT XVI

YEARLY PRICE CHANGES FOR WASTE PAPER
1968-1973
(dollars per ton)

Year	Low Price	High Price	Price Changes (Low-High)
1973	$24.69	$42.53	$17.84
1972	23.04	25.68	2.64
1971	19.34	22.99	3.65
1970	20.02	25.63	5.61
1969	25.20	26.29	1.09
1968	18.17	27.13	8.96

Source: Derived from data supplied by the Bureau of Labor Statistics

Concerning technological barriers to substitution, the following situation exists.

- Wastepaper can be used for up to 100% of materials inputs for newsprint, semi-chemical pulp and combination board
- Limits for kraft paper range from 5% to 25% depending on type
- For office, communications, and printing papers, limits range from 10% to 80% depending on product type and grade

Within the limits of current technology, then, potential for increased use of wastepaper through substitution does exist. The major long term barrier to substitution, subject to the technological limitations discussed above, is cost.

(5) The Impact of Tax Treatment Equalization on Relative Materials Use in the Long Run Is Indeterminate

On a pretax basis, the relative change in the cost/price relationship of virgin materials and wastepaper used in newsprint manufacturing, using the highest computed capital gain benefit, would be $3.10 ($1.55 x 2--see Exhibit XIII) per ton in favor of wastepaper, with the capital gains benefit removed.

In the production of paperboard, the cost/price advantage accruing to wastepaper would be $4.96 before taxes ($2.48 x 2--see Exhibit XIII) using the highest computed capital gains benefit.

The impact of a change in relative cost/price relationships of the order indicated above on long run relative materials usage cannot be quantified as the long run marginal cost of recycling wastepaper is not known.

It is probable that some substitution will occur; however, the degree of substitution will be limited by both out-of-pocket and risk related marginal costs of recycling.

* * *

The following chapter discusses the impact of discriminatory taxation on the glass industry.

V. THE GLASS INDUSTRY

This chapter addresses the impact of discriminatory taxes and tax benefits on the relative use of virgin and secondary materials in the production of glass.

1. SCRAP GLASS, KNOWN AS CULLET, MAY BE SUBSTITUTED FOR VIRGIN RAW MATERIALS IN THE PRODUCTION OF GLASS

Cleaned and sorted cullet may be substituted for virgin raw materials in the production of glass. If the cullet used is compatible in color and composition with the glass it is used to make, the final product would be indistinguishable from glass produced using virgin raw materials in characteristics and end use.

The substitutability of cullet for virgin raw materials, primarily sand, is limited in generally prevailing production processes by the requirement for cullet of like color and composition. The Glass Container Manufacturers Institute estimates that about 13% of glass currently produced is cullet based. However, the cullet used is virtually all generated within the glass producing process. With the exception of color and composition requirements, there are no significant process constraints to substantial substitution of cullet for virgin materials in the manufacture of glass.

2. THE PERCENTAGE DEPLETION ALLOWANCE PROVIDES THE BASIS FOR DISCRIMINATORY TAX BENEFITS APPLICABLE TO THE PRODUCTION OF GLASS

The basis for discriminatory tax benefits applicable to the production of glass from virgin raw materials is provided by the percentage depletion allowance which may be applied to the mining of sand. There are no taxes or tax benefits applicable to secondary materials processing which are not likewise applicable to virgin raw materials process

There are state taxes applicable to sand mining and mine exploration and development cost may be treated as expenses for tax purposes, however, the impact of these tax elements was found to be so minor as to not warrent specific consideration.

3. THE IMPACT OF THE PERCENTAGE DEPLETION ALLOWANCE ON THE COST OF PRODUCING SAND WAS COMPUTED

The impact of percentage depletion on production costs for sand and glass was computed. The analytical procedures used in preparing the computations are described below.

(1) Raw-Material Conversion Ratios Were Developed for Glass Production

To provide a basis for estimating the percentage depletion impact in terms of units of output, the following material input relationship's per ton of glass produced were developed:

Material	Quantity (pounds)
Sand	1,299
Soda Ash	426
Feldspar	157
Limestone	358
Cullet	200

The above material input relationships were developed from published data and confirmed by industry sources. The input mix shown is representative of that used in making bottle quality glass.

Detailed analysis of tax effects was confined to sand. Preliminary estimates of the impact of percentage depletion tax benefits on the cost of limestone, soda ash, and feldspar per ton of glass were as follows:

- While limestone and soda ash, which is a derivative of limestone account for 32% by weight of material inputs per ton of glass, the maximum possible tax benefit per ton of glass attributable to the percentage depletion allowance benefit available to limestone producers is $0.015 after taxes and $0.03 before taxes based upon estimates for limestone contained in Chapter VI.

- For 1970, the average per ton value of feldspar shipments was $13.28. If it is assumed that this price represented the cutoff price for computing percentage depletion, then the maximum amount of depletion claimed would be $1.86 per ton without regard to the 50% limitation. The total tax shelter provided by percentage depletion would be $0.89 per ton of feldspar or $0.07 per ton of glass. The net percentage depletion tax benefit per ton of glass representing the difference between percentage and cost depletion net tax effects, while not computed due to lack of cost depletion data would, of course, be less than 0.07 per ton. Since the computed percentage depletion benefits applicable to limestone and feldspar which are substantially overstated represent less than 0.5 percent (one-half of one percent) of the price per ton of bottle quality glass, no further attempts at refinement were considered warranted.

(2) The Dollar Impact of Percentage Depletion Per Ton of Sand and Glass Produced Was Computed For the Period 1970-1972

The impact of percentage depletion on the cost of producing glass and sand was computed for the years 1970-1972. The analysis covered producers accounting for approximately 10 percent of domestic glass quality sand output. The procedures used in preparing the impact estimates were as follows:

- Production statistics for glass quality sand were obtained from producers
- The amount of cost depletion claimed annually by each producer was estimated on the basis of depletion entries on SEC Form 10K.

- Percentage depletion was computed by applying the allowable percentage depletion rate for glass quality sand mined by each producer annually times cut off prices supplied by producers.

- The excess of percentage depletion over cost depletion was derived by subtracting estimated cost depletion from estimated percentage depletion.

- The depletion tax benefit was computed by multiplying the excess of percentage depletion over cost by 0.48.

- To evaluate the impact of the 50 percent limitation on percentage depletion (see Chapter II) which would not be reflected in the above computations a separate estimate of the reduction in each producer's tax liability attributable to depletion was developed using a process of elimination. Essentially, reductions in taxes payable attributable to all non-depletion items were estimated with the balance considered to be attributable to depletion. Data sources included SEC filings, notes to financial statements, and other available data.

- Estimated tax benefits derived using both above methods were compared and the lesser indicated benefit was used for subsequent analysis

It should be noted that the above estimating procedures may be expected to overstate rather than understate the tax benefit associated with the percentage depletion allowance as procedures for assessing the impact of the 50% depletion limitation were applied conservatively so as to understate rather than overstate potential tax benefit reductions.

4. DEPLETION TAX BENEFITS PROBABLY HAVE ONLY A MARGINAL IMPACT ON PRODUCER MATERIALS CHOICES

The estimated impact of the percentage depletion allowance on the cost of producing sand and glass is shown on Exhibit XVII, following this page. On an after tax basis, the maximum computed

EXHIBIT XVII

IMPACT OF THE PERCENTAGE DEPLETION ALLOWANCE ON THE COST OF PRODUCING SAND AND GLASS 1970-1972

U.S. TAX TREATMENT	DOLLARS PER TON & PERCENT OF PRICE ①											
	GLASS QUALITY SAND						GLASS ①					
	1972		1971		1970		1972		1971		1970	
DEPLETION	$ 0.17	% 5.1	$ 0.17	% 5.1	0.17	% 5.1	$ 0.11	% LESS THAN 1	$ 0.11	% LESS THAN 1	$ 0.11	% LESS THAN 1

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① **PRICE DATA**

SAND: $3.31 PER TON

GLASS: $14.29 - $15.18 PER TON

THIS EXHIBIT COVERS APPROXIMATELY 10% OF TOTAL GLASS-QUALITY SAND MINED IN THE U.S.

NOTE: WHILE DATA WERE OBTAINED FROM RELIABLE SOURCES, THE SCOPE OF THE BOOZ, ALLEN ASSIGNMENT DID NOT INCLUDE AN AUDIT OR INDEPENDENT VERIFICATION OF THESE DATA.

SOURCE: BOOZ, ALLEN & HAMILTON, INC.

AVERAGE MATERIAL REQUIREMENTS FOR ONE TON OF GLASS (BOTTLE QUALITY)

SAND	1,299	LBS.
SODA ASH	426	LBS.
FELDSPAR	157	LBS.
LIMESTONE	358	LBS.
CULLET	200	LBS.

OTHER MATERIALS (POTASSIUM, MAGNESIUM) MAY BE ADDED, DEPENDING UPON QUALITY.

Note: Impacts are shown on an after-tax basis.

percentage depletion benefit is $0.17 per ton for sand and $0.11 per ton for glass. If computed benefits applicable to limestone, soda ash and feldspar, which admittedly are substantially overstated, are included the percentage depletion benefit would be approximately $0.19 per ton after taxes and $0.38 per ton before taxes. Total benefits would be equal to approximately 1.2% of the price of glass after taxes and 2.5% before taxes.

Industrial source cullet is currently almost fully recovered. Additional cullet use could require cullet recovery from post-consumer waste, primarily from glass in bottles. While bottle recovery for cullet is in limited practice, the economies of collection, separation and transportation are unfavorable. While precise quantitative data are not available, it can be stated that an adjustment of relative materials costs up to a maximum of $0.38 per ton in favor of cullet would likely be insufficient to offset high collection, separation and transportation costs.

Were municipalities or regional governments to absorb collection and separation costs in reclamation centers, the economies of recycling could potentially be improved. The impact of such practices on cullet usage will depend on the costs involved, which are not known at this time.

* * *

The following chapter discusses the impact of discriminatory taxation on the steel industry.

VI. THE STEEL INDUSTRY

This chapter presents findings and conclusions regarding the impact of discriminatory taxes and tax benefits on the relative use of virgin and secondary materials in the manufacturing of steel.

1. STEEL SCRAP MAY BE SUBSTITUTED FOR VIRGIN RAW MATERIALS IN THE STEELMAKING FURNACE

In the manufacture of steel from virgin raw materials, coke, iron ore, and limestone are charges into a blast furnace to produce pig iron which is in turn treated in a steel making furnace to produce steel. Steel scrap may be substituted for pig iron in the steelmaking furnace. Accordingly, it may be said that steel scrap and pig iron produced from virgin materials are functionally equivalent at the raw steelmaking stage of production. For most uses, steel produced from scrap is indistinguishable from steel produced from virgin raw materials.

Limitations on the substitutability of scrap for pig iron are related to the type of steelmaking process used. The limitations connected with each of the three primary steel making processes are summarized briefly below:

- The basic oxygen process is currently the most widely used steelmaking process accounting for 56 percent of 1972 raw steel production. Current practice limits scrap usage to 30 percent of the basic oxygen furnace (BOF) charge, the balance of the charge being molten pig iron. Scrap usage in BOF's could be increased by installing facilities to preheat scrap prior to charging the furnace.

- The electric furnace which accounted for about 18 percent of 1972 raw steel output is designed to accept a 100 percent scrap charge.

- The open hearth furnace which is being rapidly displaced by the basic oxygen furnace is normally charged with about 44 percent scrap. This method of steelmaking, however, is expected to decrease rapidly in use.

2. THERE ARE SEVERAL ELEMENTS OF TAXATION APPLICABLE TO THE PRODUCTION OF VIRGIN RAW MATERIALS USED IN STEELMAKING WHICH ARE NOT APPLICABLE TO THE COLLECTION AND MARKETING OF STEEL SCRAP

As indicated above, the virgin raw materials used in steelmaking are iron ore, coal (coke) and limestone. There are several elements of taxation applicable to the production of these materials which are not applicable to the collection and marketing of steel scrap. These are summarized below:

- Iron Ore
  - The percentage depletion allowance
  - Tax treatment of mine exploration and development costs
  - The foreign tax credit
  - Mineral related state taxes
- Coal
  - The percentage depletion allowance
  - Tax treatment of mine exploration and development costs
  - Mineral related state taxes

- Limestone
  - The percentage depletion allowance

There are no taxes or tax benefits applicable to the collection and marketing of steel scrap which are not also applicable to virgin raw material production. The nature and applicability of the taxes and tax benefits identified above are discussed in Chapter II.

3. THE COST IMPACT OF APPLICABLE TAXES AND TAX INCENTIVES WAS COMPUTED FOR THE MANUFACTURING OF RAW STEEL

Virgin raw material used in manufacturing steel are produced by both non-integrated raw material suppliers and integrated steel producers. To isolate any impact differentials possibly related to differing degrees of integration, impacts were separately computed covering the following production stages:

- Non-integrated production of iron ore
- Non-integrated production of coal
- Integrated steel production including:
  - Iron ore, coal, and limestone production by integrated producers
  - Raw steel production

(1) Raw Materials Conversion Ratios Were Developed for Steelmaking

To provide a basis for developing estimates of tax impacts on a unit of output basis, the following raw material inputs per ton of steel produced were used:

Material	Quantity (tons)
Iron Ore	1.20
Coal	0.60
Limestone	0.18
Steel scrap	0.45

These input quantities represent a weighted average of material currently used in open hearth and basic oxygen furnaces. Material usage in electric furnace steelmaking was excluded from consideration as virgin raw materials are not used to any significant degree with this process.

(2) Estimates Were Prepared of the Impacts of Applicable Taxes and Tax Benefits on the Cost of Iron Ore Production by Non-Integrated Mining Companies for the Period 1970 - 1972

The impact of applicable taxes and tax benefits on the cost of iron ore production for the period 1970 - 1972 was computed for U. S. producers accounting for approximately 34 percent of non-integrated iron ore output. Specific taxes and tax benefits included in the analysis were percentage depletion, tax treatment of exploration and development expenses and state taxes. The procedures used in preparing the impact estimates are described below:

- Percentage Depletion

  Tax benefits associated with the excess of percentage depletion over cost depletion were computed as follows:

  - Annual iron ore production quantities were obtained from producers

- The amount of cost depletion claimed annually by each producer was estimated on the basis of depletion entries on SEC Form 10K.
- Percentage depletion was computed by applying the allowable percentage depletion rate for iron ore mined by each producer annually times cut off prices supplied by producers.
- The excess of percentage depletion over cost depletion was derived by subtracting estimated cost depletion from estimated percentage depletion.
- The depletion tax benefit was computed by multiplying the excess of percentage depletion over cost by 0.48.
- To evaluate the impact of the 50 percent limitation on percentage depletion (see Chapter II) which would not be reflected in the above computations, a separate estimate of the reduction in each producer's tax liability attributable to depletion was developed using a process of elimination. Essentially, reductions in taxes payable attributable to all non-depletion items were estimated with the balance considered to be attributable to depletion. Data sources included SEC filings, and notes to financial statements, supplemented in some cases by data made available by producers.
- Estimated tax benefits derived using both above methods were compared and the lesser indicated benefit was used for subsequent analysis

It should be noted that the above estimating procedures may be expected to overstate rather than understate the tax benefit associated with the percentage depletion allowance as procedures used to estimate the impact on benefits of the 50% depletion limitation were applied conservatively to ensure against overstating the reduction in benefits attributable to the limitation.

- Tax Treatment of Exploration and Development Costs

  Benefits associated with the expensing of mine exploration and development costs were estimated on the basis of data made available by producers and analysis of expense accounts on producers' financial statements. Adjustments were made where required to isolate development expenses attributable to mining activities. The basis for estimating the tax benefit in each year was computed as the net reduction in the current year's tax liability achieved through treating such costs as expenses rather than capital investments.

  The dollar value of the tax benefits was considered to be the time value of the deferred tax liability discounted at 6.5 percent over an average period of 12.5 years.

- State Taxes

  The impact of state taxes on production costs was estimated by applying state tax rates to iron ore production values and/or quantities by geographic source. The discount rate used represents a conservative estimate of the cost of borrowing while the time period used (12.5 years) represents an amortization period were expenditures capitalized.

(3) The Impact of Applicable Tax Benefits on the Cost of Metallurgical Grade Coal Production Was Computed for Non-Integrated Producers

The tax benefits provided by the percentage depletion allowance and the expensing of mine exploration and development costs were computed for non-integrated coal producers accounting for 20 percent of domestic metallurgical grade coal production. The period covered was 1970-1972. Analytical procedures used were the same as those used in the analysis of non-integrated iron ore production.

(4) The Impact of Applicable Taxes and Tax Benefits on the Cost of Integrated Raw Steel Production Was Separately Estimated

Separate estimates were prepared of the impact of applicable taxes and tax benefits on the cost of integrated steel production for the period 1970-1972. Estimates were based on data covering producers accounting for about 54 percent of domestic steel shipments. Analytical procedures used were as follows:

- The Percentage Depletion Allowance

  - Domestic depletion benefits for coal, limestone and iron ore were computed on the basis of aggregated proprietary tax data provided by several producers.

  - Foreign depletion tax benefits applicable to iron ore for which data was not made available by producers was estimated using the procedures described above for non-integrated iron ore production

- The Foreign Tax Credit

  Tax benefits associated with foreign tax credits applicable to iron ore mining operations were estimated as follows:

  - Revenues from foreign operations and foreign taxes paid were obtained from producer financial statements, SEC filings and, to a limited extent, from direct producer contacts.

  - Estimates were developed on the basis of foreign iron ore production statistics and iron ore cut-off prices supplied by producers of that portion of total foreign revenues attributable to iron ore mining operations.

- Foreign taxes paid were estimated on the basis of the assumption that the share of total foreign taxes paid in a given year attributable to iron ore mining operations was proportional to the share of total foreign revenues attributable to such operations

- The foreign taxes paid were assumed to be fully creditable against U. S. taxes

- The tax benefit associated with the foreign tax credit was estimated as 48 percent of the foreign tax credit taken (equal to foreign taxes paid). This represents the differential in tax liability resulting from the treatment of foreign taxes paid as a tax credit rather than as a deduction.

Tax Treatment of Mine Exploration and Development Costs

Exploration and development expenses were estimated in aggregate for all integrated producer mining operations as disaggregated data were not available. Estimating procedures used were the same as those described previously for non-integrated iron ore and coal mining.

State Taxes

State Taxes applicable to integrated iron ore mining were estimated using the same procedures as described for non-integrated iron ore mining. The impact of state taxes on the unit cost of coal and limestone production were evaluated and found not to be material.

4. THE PERCENTAGE DEPLETION ALLOWANCE IS THE MOST SIGNIFICANT TAX BENEFIT INFLUENCING THE COST OF NON-INTEGRATED IRON ORE PRODUCTION

Exhibit XVIII, following this page, summarizes the impact of applicable taxes and tax benefits on the cost of non-integrated iron ore production over the period 1970-1973. The range indicated in each year represents the highest and lowest computed impacts for those producers analyzed.

Variations in computed depletion benefits can be attributed to the influence of the 50 percent limitation (see Chapter II) on percentage depletion which is in turn influenced by producers' profitability. The benefits associated with exploration and development expenses will vary from producer to producer and from year to year depending on the level of exploration and development activity. The costs attributable to state taxes vary depending on the location of mines and, in some cases, the grade and type of iron ore produced.

The range of computed tax impacts per ton of iron ore for 1972 is summarized below.

	High		Low	
	$	%	$	%
Depletion	$0.66	113.8	$0.20	87.0
Exploration and Development Expenses	0.10	17.2	0.08	34.8
State Taxes	(0.18)	(31.0)	(0.05)	(21.8)
Total	$0.58	100.0	$0.23	100.0

The percentage depletion allowance has clearly the overriding influence on production costs. It may be said that state taxes and the benefits of expensing exploration and development costs are mutually offsetting in most cases. (See Exhibit XVIII for 1970, '71 data).

EXHIBIT XVIII

IMPACT OF SELECTED TAXES AND TAX INCENTIVES ON COST OF NON INTEGRATED IRON ORE PRODUCTION
1970-1972

U.S. TAX TREATMENT	DOLLARS PER TON & PERCENT OF IRON ORE PRICE ①											
	1972				1971				1970			
	$	$	$	% %	$	$	$	% %	$	$	$	% %
	HIGH	MEDIAN	LOW	RANGE	HIGH	MEDIAN	LOW	RANGE	HIGH	MEDIAN	LOW	RANGE
DEPLETION	0.66	0.27	0.20	1.1 5.9	0.37	0.27	0.11	0.6 3.2	1.00	0.28	0.16	0.9 9.3
EXPLORATION AND DEVELOPMENT EXPENSES	0.10	0.09	0.03	LESS THAN 1	0.20	0.13	0.10	0.6 1.8	0.14	0.11	0.09	0.5 1.3
STATE TAXES	(0.18)	(0.11)	(0.05)	LESS THAN 1	(0.21)	(0.15)	(0.06)	LESS THAN 1	(0.13)	(0.09)	(0.04)	0.2 1.2

	$	$	$	% %	$	$	$	% %	$	$	$	% %
TOTAL IMPACT	0.53	0.25	0.23	1.2 5.2	0.36	0.25	0.15	0.8 3.2	1.01	0.30	0.21	1.2 9.4

①

PRICE DATA FOR IRON ORE

	DOMESTIC			FOREIGN		
	1972	1971	1970	1972	1971	1970
IRON ORE – NATURAL	11.17 12.82	11.42 12.75	10.20 12.01	9.98	9.98	9.98
IRON ORE – PELLETS	17.78	17.75	16.95	11.17	11.17	10.80

NOTE: THE PRICE OF NATURAL IRON ORE DEPENDS ON THE SOURCE AND CHEMICAL STRUCTURE OF THE ORE.

THE PRICE OF PELLETS IS HIGHER THAN THAT OF NATURAL IRON ORE BECAUSE OF ADDITIONAL PREPARATION COSTS. TO DETERMINE GROSS INCOME FOR DEPLETION, THESE ADDITIONAL COSTS ARE INCLUDED IN THE "F.O.B. MINE VALUE" PRICE USED.

APPROXIMATELY 34% OF IRON ORE MINED BY NON-INTEGRATED U.S. COMPANIES IS COVERED BY THIS EXHIBIT.

Note: Impacts are shown on an after-tax basis

BENEFITS ASSOCIATED WITH THE CAPITAL GAINS TREATMENT OF ROYALTIES ON IRON WERE EVALUATED AND WERE NOT FOUND TO BE MATERIAL

NOTE: WHILE DATA USED IN THESE EXHIBITS WERE OBTAINED FROM RELIABLE SOURCES, THE SCOPE OF THE BOOZ, ALLEN ASSIGNMENT DID NOT INCLUDE AN AUDIT OR INDEPENDENT VERIFICATION OF THESE DATA

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5. PERCENTAGE DEPLETION AND THE TAX TREATMENT ALLOWED FOR EXPLORATION AND DEVELOPMENT COSTS HAVE NEARLY EQUAL IMPACTS ON THE COST OF NON-INTEGRATED METALLURGICAL GRADE COAL PRODUCTION

Exhibit XIX, following this page, summarizes the impact of percentage depletion and the tax treatment allowed for exploration and development expenses on the cost of non-integrated metalurgical grade coal production for the period 1970-1972. The range of impacts indicated in each year results from the following:

- The operation of the 50 percent percentage depletion limitation (see Chapter II) which varies with profitability
- The level of exploration and development activity in each year by each producer

As indicated on the Exhibit, percentage depletion accounts for the largest share of total impact, up to 70 percent in 1972 (low), however, in some cases, notably 1970 and 1971, depending on the behavior of the variables identified above, the impact of tax treatment allowed for exploration and development costs nearly equals that of percentage depletion.

The maximum computed total tax benefit in any year is $0.48 per ton in 1971 while the lowest computed benefit is $0.16 per ton also in 1971. The net cost reductions attributable to these benefits were equal to 1.4 - 4.0 percent of the 1971 price per ton of metallurgical grade coal on an after tax basis.

6. THE PERCENTAGE DEPLETION ALLOWANCE IS THE PRIMARY FACTOR INFLUENCING THE IMPACT OF APPLICABLE TAXES AND TAX BENEFITS ON THE COST OF INTEGRATED STEELMAKING

Exhibit XX summarizes the impact of the applicable taxes and tax benefits on the cost of integrated raw steel production for the period 1970-1972. The impacts indicated were computed independently

EXHIBIT XIX

IMPACT OF SELECTED TAX BENEFITS ON THE COST OF INTEGRATED METALLURGICAL COAL PRODUCTS 1970-1972

U. S. TAX TREATMENT	DOLLARS PER TON & PERCENT OF PRICE ①											
	1972				1971				1970			
	$	$	$	% %	$	$	$	% %	$	$	$	% %
	HIGH	MEDIAN	LOW	RANGE	HIGH	MEDIAN	LOW	RANGE	HIGH	MEDIAN	LOW	RANGE
DEPLETION	0.21	0.19	0.17	1.2-1.5	0.32	0.21	0.09	0.8-2.7	0.20	0.17	0.13	1.3-1.9
EXPLORATION AND DEVELOPMENT EXPENSES	0.16	0.11	0.07	0.5-1.2	0.16	0.11	0.07	0.6-1.4	0.16	0.11	0.07	0.7-1.5
TOTAL IMPACT ②	0.37	0.30	0.24	1.2-2.7	0.48	0.32	0.16	1.4-4.0	0.36	0.28	0.20	1.9-3.5

① PRICE DATA FOR COAL
(METALLURGICAL GRADE COAL)

YEAR	PRICE	
1972	$ 13.76	SHORT TON
1971	$ 11.71	SHORT TON
1970	$ 10.37	SHORT TON

⊙ APPROXIMATELY 20% OF THE METALLURGICAL GRADE COAL MINED IN THE UNITED STATES IS COVERED BY THIS EXHIBIT

NOTE: WHILE DATA WERE OBTAINED FROM RELIABLE SOURCES, THE SCOPE OF THE BOOZ, ALLEN ASSIGNMENT DID NOT INCLUDE AN AUDIT OR INDEPENDENT VERIFICATION OF THESE DATA.

② BENEFITS ASSOCIATED WITH THE CAPITAL GAINS TREATMENT OF ROYALTIES ON COAL, WITH THE 5-YEAR AMORTIZATION OF COAL MINE SAFETY EQUIPMENT AND WITH THE PARTIAL EXEMPTION OF EXPORT INCOME (DISC) WERE EVALUATED AND WERE NOT FOUND TO BE MATERIAL.

③ STATE TAXES (PRINCIPALLY WEST VIRGINIA), AND LOCAL TAXES, (PRINCIPALLY COMMUNITIES IN WEST VIRGINIA) WERE EVALUATED AND NOT FOUND TO BE MATERIAL.

SOURCE: BOOZ, ALLEN & HAMILTON, INC.

Note: Impacts are shown on an after-tax basis

EXHIBIT XX

IMPACT OF SELECTED TAXES AND TAX BENEFITS ON THE COST OF INTEGRATED RAW STEEL PRODUCTION
1970-1972

U.S. TAX TREATMENT		DOLLARS PER TON & PERCENT OF PRICE																						
		IRON ORE						COAL						LIMESTONE						RAW STEEL ②					
		1972		1971		1970		1972		1971		1970		1972		1971		1970		1972		1971		1970	
		$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%
DEPLETION	DOMESTIC	632	5657	605	5758	524	5354	223	2.3	332	3.3	459	4.3	024	1.4	029	1.8	039	2.4						
	FOREIGN	520	5554	550	5556	[illegible]	4849																		
	AVERAGE	586	5152	607	5253	532	4950													904	1.2	958	1.4	920	1.4
TAXES PAID OR DEEMED PAID TO FOREIGN GOVERNMENTS		213	1219	271	2324	285	2526													255	LESS THAN 1	325	LESS THAN 1	342	LESS THAN 1
EXPLORATION AND DEVELOPMENT EXPENSES ③																				275	LESS THAN 1	281	LESS THAN 1	297	LESS THAN 1
STATE TAXES		(192)	1.7	(217)	1.9	(182)	1.7													(192)	LESS THAN 1	(217)	LESS THAN 1	(182)	LESS THAN 1
		$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%
TOTAL IMPACT ①																				1.252	1.7	1.347	1.96	1.377	2.09

① [illegible] DATA FOR IRON ORE, COAL, LIMESTONE AND RAW STEEL

		1972	1971	1970
IRON ORE DOMESTIC (NATURAL)	$	11.17 11.42	11.42 11.57	10.80 10.95
IRON ORE FOREIGN (NATURAL)		9.90	9.93	9.98
COAL		13.76	11.71	10.37
LIMESTONE		1.70	1.62	1.65
RAW STEEL (COST)		71.07	68.98	65.73

② AVERAGE QUANTITIES OF MATERIALS CONSUMED IN THE MANUFACTURE * OF ONE TON OF RAW STEEL (WEIGHTED AVERAGE)

	1972	1971	1970
IRON ORE (NET TONS)	1.20	1.20	1.20
COAL (NET TONS)	.61	.59	.61
LIMESTONE (NET TONS)	.18	.18	.19
SCRAP (NET TONS)	.44	.46	.44

*DOES NOT INCLUDE ELECTRIC FURNACE

APPROXIMATELY 54% OF U.S. STEEL SHIPMENTS ARE COVERED IN THIS EXHIBIT

③ DATA AGGREGATION PRECLUDED THE ALLOCATION OF EXPLORATION AND DEVELOPMENT EXPENSES TO SPECIFIC RAW MATERIALS

NOTE: WHILE DATA USED IN THESE EXHIBITS WAS OBTAINED FROM RELIABLE SOURCES, THE SCOPE OF THE BOOZ, ALLEN ASSIGNMENT DID NOT INCLUDE AN AUDIT OR INDEPENDENT VERIFICATION OF THESE DATA.

④ BENEFITS ASSOCIATED WITH WESTERN HEMISPHERE TRADE CORPORATIONS (WHTC), WITH THE EXCLUSION OF DIVIDENDS OF LESS DEVELOPED COUNTRY CORPORATIONS [illegible] AND WITH THE CAPITAL GAINS TREATMENT OF ROYALTIES ON COAL AND IRON [illegible] MATERIAL.

Note: Impacts are indicated on an after-tax basis

of those shown for non-integrated iron ore and coal production. Because much of the data used in preparing the analysis was supplied on an aggregated basis by an industry source average impact rather than ranges are shown. A comparison of the estimates developed for integrated production with those developed for non-integrated iron ore and coal production indicates, however, that the estimates prepared for integrated production fall generally within the range of those developed for non-integrated production.

The impact of the applicable taxes and tax benefits (after-tax basis) on the cost of raw steel production is summarized below.

	1972		1971		1970	
	$	%	$	%	$	%
Depletion	$.904	72.2	$.958	71.1	$.920	66.8
Foreign Tax Credit	.265	21.3	.325	24.1	.342	24.8
Tax Treatment of Exploration and Development Costs	.275	22.0	.281	20.9	.297	21.6
State Taxes	(.192)	(15.4)	(.217)	(16.1)	(.182)	(13.2)
Total	$1.252	100.0	$1.347	100.0	$1.377	100.0

As is apparent, the percentage depletion allowance has the greatest impact on costs amounting to about 70 percent of the net after tax benefit per ton of raw steel produced. Regarding the cost impact of all tax benefits, the following are pertinent:

- The highest computed impact, $1.377 per ton of raw steel for 1970, represents approximately 2.1% of the cost of producing raw steel. For finished steel the impact would be equal to $1.969 per ton, assuming that 1.43 tons of raw steel are required to produce a ton of finished steel. This would be equal to about 0.9% of current average finished steel prices ($228 per ton).

- On a pre-tax basis, the impacts cited above would be equal to $2.87 per raw steel ton, or about 4.4% of estimated 1970 raw steel production costs. For finished steel, the pre-tax impact would be $4.10 per ton, or about 1.8% of current finished steel prices.

(1) Low Cost Scrap Sources Are Almost Fully Utilized

To obtain an understanding of the market for steel scrap, it is necessary to understand the three basic sources of scrap.

- Steel Mills--Between the production of steel ingot and the production of finished steel mill products, about 30% of the volume of ingot steel produced becomes scrap. In general, steel mills are configured to recycle such scrap internally. Scrap of this type is referred to as "home scrap." Home scrap is the least costly of steel scrap, for obvious reasons, and is, for practical purposes, 100% recycled.

- Steel Fabricators--Steel scrap is also generated in the production of products containing steel, such as automobiles, appliances, and machinery. This scrap is referred to as "prompt industrial scrap". Prompt industrial scrap is usually purchased by steel producers either through scrap processors or directly from the scrap producers. Most scrap from this source is currently recycled.

- Post-Consumer Scrap--Discarded products containing steel are the third source of scrap. Specific products include automobiles, appliances, ships, machinery and containers. Appliances and containers are usually a part of the municipal solid waste system. Automobiles can move through several avenues such as from the owner to the wreckers or to scrap processors for sale through broker to steel producer. Heavy machinery or ships generally move directly from owner to scrap processor. Substantial quantities of readily accessable post-consumer scrap are currently recycled.

Because of the above factors, increased demand for scrap will have to be met through recovery from scrap sources which are difficult and costly to use.

(2) The Current Volatility of Scrap Prices Presents a Major Barrier to Its Increased Use

Relatively minor changes in the demand for scrap are accompanied by very large fluctuations in the price paid by producers for scrap. During the period from June 1972 to June 1973, the price of No. 1 heavy melting scrap increased from $35.20 per ton to $55.00 per ton, or 56 percent. Over this period then, the raw materials cost of producing raw steel in electric furnaces, using 100% purchased scrap, has increased by approximately $19.80 per ton before taxes and $9.90 after taxes. During the past five years the price of No. 1 heavy melting scrap has fluctuated an average of $9.93 per ton annually from low to high, with a minimum annual fluctuation of $7.83 per ton in 1968.

(3) Virgin Raw Material Markets Are Significantly More Stable Than Scrap Markets

Vertical integration into the extraction of iron ore, coal, and limestone is common among the major domestic steel producers. About 70% of the iron ore consumed by U.S. producers is produced domestically, with the balance imported, primarily from Canada and Venezuela. The coal and limestone consumed in making steel is produced domestically.

The practice of vertical integration and the stability of supply from the mines result in a relatively stable producer cost of raw materials with cost/price changes occurring gradually over time in a manner that is somewhat easily forecasted. Thus virgin material users are insulated from the large short-term price fluctuations found by purchasers of scrap. Integrated companies also have substantial investments in virgin raw materials sources which will act to limit the degree to which scrap will be substituted for virgin materials.

(4) There Are No Major Technological Barriers to Increased Scrap Usage

The greatest potential for future increased scrap usage in steelmaking lies in the development of new electric furnace capacity. As indicated previously, electric furnaces can use up to 100% scrap. Basic oxygen furnaces can accommodate small percentage increases in scrap usage without modification.

Additional scrap supplies, derived primarily from post-consumer waste, would contain greater amounts of impurities than scrap presently used. If such scrap represented a relatively minor proportion of total furnace input, however, the additional impurities could be handled in the manufacture of inexpensive steels without extensive technological change.

(5) Tax Treatment Equalization May Cause Some Marginal Increase in Scrap Usage

At the present time, about 18% of steel output is accounted for by electric furnaces consuming scrap. Any change in relative materials costs in favor of scrap would tend to make electric furnace production more attractive. Some limited increase in scrap utilization in other steelmaking processes may also be expected, subject to the technological limitations mentioned above.

During 1973, a scrap shortage developed as export buyers outbid domestic purchasers for available supplies. This situation developed as foreign steel prices increased at a much faster rate than domestic prices which are subject to price controls. With a return to a free market, this situation should correct itself. While the domestic-foreign price imbalance exists, however, scrap for domestic producers should remain in short supply, subject of course to the extension of scrap export limitations.

In the long run, the degree to which scrap utilization increases will depend on the marginal cost of bringing additional quantities of scrap into the market place. Such costs will undoubtedly include some discounting of market risk. Definitive statements as to the effectiveness of tax treatment equalization are not possible as neither the short nor the long run marginal costs of additional scrap are known. As indicated in preceding chapters, however, the establishment of mechanisms such as municipal reclamation centers, if they prove feasible, can provide a means of accommodating market risk.

* * *

The following chapter discusses the impact of discriminatory taxation on the rubber and plastics industries.

VII. THE RUBBER AND PLASTICS INDUSTRIES

This chapter addresses the impact of discriminatory taxation on the relative use of virgin and secondary materials in the production of rubber and plastics.

1. THE SUBSTITUTABILITY OF SECONDARY MATERIALS FOR VIRGIN RAW MATERIALS IN THE MANUFACTURE OF RUBBER AND PLASTICS IS LIMITED

Both rubber (synthetic rubber) and plastics are petrochemical based. The basic materials used in producing both products are crude petroleum and natural gas. For both rubber and plastics the substitution of secondary materials for virgin raw materials in the production process is extremely limited under present industry practices.

(1) Reclaimed Rubber is a Substitute for Rubber Produced From Virgin Materials

Reclaimed rubber is a substitute for rubber produced from virgin materials. In many uses, the proportion of reclaimed rubber which can be used is limited by product specification requirements. For example, high speed tires (automobile tires) may contain only a limited proportion of reclaimed rubber for reasons of performance and safety. Lower speed tires such as those used on farm equipment may contain a higher percentage of reclaimed rubber. The use of reclaimed rubber has been declining in recent years for reasons which are discussed in following sections of this chapter.

(2) The Substitutability of Secondary Plastics For Virgin Plastics is Limited

At the present time, the quantity of plastics which is reclaimed is insignificant. Thermosetting plastics may not be remelted as they are produced by a molecular bonding process and would be destroyed by heat. In addition, it is not possible to reduce such plastics by chemical means. Exhibit XXI, following this page describes uses of the major thermosetting plastics.

Thermoplastics, described in Exhibit XXII, compose the bulk of plastics entering the solid waste stream. Such plastics may be remelted and reused. What remelting does take place, however, is in practice, largely confined to in-plant scrap for the following reasons:

- Plastics for remelting must normally be segregated by type and grade. Separation of mixed plastic waste has proven to be impractical using commercially available techniques. As an indicator of the magnitude of the separation it may be noted that there are more than 700 grades of polyethelene plastics alone.
- Degradation of resin properties occurs in the process of reclamation.

Recycling of plastic waste is currently practiced to a limited extent. The processes involved, however, require that the plastic scrap be reprocessed into lower quality plastics for uses not requiring exacting product performance properties. Some examples include the reprocessing of milk containers for use in making soil pipe and the manufacture of novelty items from mixed scrap plastics. It is apparent, however, that such reprocessing does not produce large volume plastic products.

For practical purposes thermosetting plastic scrap has no virgin raw material counterpart because of the limitations on reuse

EXHIBIT XXI

THERMOSETTING PLASTICS

Type	Uses
Alkyds	Electrical insulation, electronic components, putty, glass-reinforce parts, paints
Arninos	Molding compounds, adhesives, laminating resins, paper coating, textile treatments, plywood dinnerware, decorating structures
Epoxies	Laminates, adhesives, flooring, linings, propellers, surface coatings, filament-wound structures (rocket cases)
Phenolics	Impregnating resins, brake lining, rubber resins, electrical components, structural board, laminates, glues, adhesives, binders molds
Polyesters	Construction, auto-repair putty, laminates, skis, fishing rods, boats and aircraft components, coatings, decorative fixtures
Silicones	Mold-release agents, rubbers, laminates encapsulating resins, antifoaming agents, water-resistant uses

EXHIBIT XXII (1)

THERMOPLASTICS

Type	Uses
Polycarbonates	Replacement for metals, safety helmets, lenses, electrical components, photographic film, die casting, insulator
Polyamides	Unlubricated bearings, fibers, gears, appliances, sutures, fishing lines, tires, watch straps, packaging bottles
Polyurethanes	Insulation, foam inner liners for clothing, coatings, rocket fuel binders, elastomers
Polyethers	Coatings, pump gears, water-meter parts, bearing surfaces, valves
Phenoxies	Surface coats, adhesives, binders, electronic parts
Polyethylene	Packaging films and sheets, containers, wire and cable insulation, pipe, linings, coatings, molds, toys, housewares
Polypropylene	Housewares, medical equipment (can be sterilized), appliances, toys, electronic components, tubing and pipe (can be welded), fibers and filaments, coatings
Fluorocarbons	Electrical insulation, mechanical seals, gaskets, linings for chemical equipment, bearings, frying-pan coatings, cryogenic applications
Polyvinyl Chloride	Pipe and tubing, pipe fittings, adhesives, raincoats and baby pants, building panels, wastepaper baskets, weather stripping, shoes

EXHIBIT XXII (2)

Type	Uses
Acrylics	Decorative and structural panels, massive glazing domes, automotive lens systems, illuminated translucent floor tiles, windows and canopies, signs, coating, adhesives, elastomers
Polystyrene	Insulation, pipe, foams, cooling towers, thin-walled containers, appliances, rubbers, automotive instruments and panels
Cellulosics	Textile and paper finishes, thickening agents, magnetic tapes, packaging pipe
Furanes	Laminates, coatings, impregnants, linings for rocket fuels, floor tiling, abrasive wheels

discussed above. In any event, such plastics account for a minor share of plastics entering the solid waste stream. Accordingly thermosetting plastics have not been considered in subsequent analysis.

Thermoplastic scrap, keeping in mind the limitations discussed above, may be regarded as functionally equivalent to virgin raw material based thermoplastic resins.

2. THERE ARE SEVERAL ELEMENTS OF TAXATION APPLICABLE TO THE PRODUCTION OF VIRGIN RAW MATERIALS AND IN THE MANUFACTURE OF RUBBER AND PLASTICS WHICH ARE NOT APPLICABLE TO SCRAP COLLECTION AND REUSE.

There are no taxes or tax benefits applicable to secondary rubber and plastics collection and use which are not applicable to virgin materials production. There are, however, several elements of taxation unique to the production of petroleum and natural gas, the virgin raw materials from which rubber and plastics are made. They are as follows:

- Regulations providing tax benefits:
    - The percentage depletion allowance on petroleum and natural gas
    - The foreign tax credit
    - Tax treatment of well exploration and development costs and intangible drilling costs

- Applicable taxes
  - State taxes on petroleum and natural gas
  - Minimum tax on tax preferences (applicable to depletion)
  - Tax benefits associated with Western Hemisphere Trade Corporations were excluded from direct consideration as WHTC's play only a minor role in the overall extraction of petroleum and natural gas for U.S. consumption.

3. THE IMPACT OF THE APPLICABLE TAXES AND TAX BENEFITS ON THE COST OF PRODUCING RUBBER AND PLASTICS HAS BEEN COMPUTED

The impacts of the taxes and tax benefits identified above on the cost of producing SBR synthetic rubber and selected plastic resins were computed for the period 1969-1971. The plastic resins included in this analysis were as follows:

- High and low density polyethelene
- Polyvinyl chloride
- Polystyrene

These resins are in common use and represent a large proportion of the plastics entering the solid waste stream.

The primary sources of data used in estimating tax impacts were as follows:

- Consolidated tax data covering several major petroleum and natural gas producers provided by the American Petroleum Institute and the Petroleum Industry Research Foundation, Inc.

- Published producer financial and production statistics
- SEC Form 10K
- U.S. Department of the Interior, Bureau of Mines
- Selected tax and statistical data provided by several of the producers of petroleum and natural gas contacted during the study.

Petroleum and natural gas, and petrochemical producers contacted during the study, for the most part were unwilling to provide proprietory tax data. Producers contacted, however, were quite helpful in verifying data developed from the sources and developing material balancing data and production cost flow estimates for the production of petrochemical feedstocks and plastic resins.

The tax analysis performed covers petroleum and natural gas producers accounting for approximately 60 percent of U.S. outputs.

The analytical procedures used in preparing the impact estimates are described below.

(1) Materials Cost Flow Estimates Were Prepared For the Production of Synthetic Rubber and Plastics

The dollar amounts of raw materials costs in the unit prices of selected plastic resins and SBR rubber were computed to provide a basis for estimating tax impacts on intermediate and final products. Cost/price flows were developed for the feedstocks most commonly used in producing the plastic resins of interest and SBR rubber. The cost/price components estimated at each stage of production were materials, utilities, labor, overhead and capital charges. The basic data used in preparing the estimates was obtained from a published source containing 1965 data. Current materials balancing and cost/price data provided by several petroleum chemical industry sources were used to verify and update the published data. While the cost/price data finally used do not reflect some recent component changes, such as increased feedstock costs and some reductions in labor and overhead costs, total cost/price estimates are in line with 1972 figures.

Materials and cost/price flow estimates for the production of synthetic rubber are presented in Exhibit XXIII, following this page. Similar flows are provided for the plastics of interest in Exhibit XXIV. Since the plastics and rubber industries make use of several common intermediate products, some of the detailed cost price data provided in Exhibit XXIII, covering SBR rubber production, is not duplicated in Exhibit XXIV, covering plastics production.

(2) Dollar Tax Impacts Per Barrel of Crude Petroleum and Per Thousand Cubic Feet of Natural Gas Were Computed for the Period 1969-1971

The dollar impacts of each applicable element of taxation on the unit costs of producing crude petrolium and natural gas were computed annually for the period 1969-1971. Estimates for 1972 were not prepared as data for that year of the quality obtained from industry sources for the period 1969-1971 were not available. Analytical procedures used were as follows:

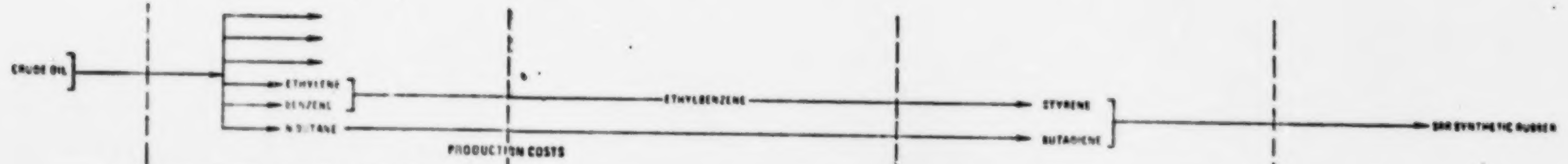
- Depletion Tax Benefits

  The procedures used in estimating unit depletion tax benefits were as follows:

  - Annual units of domestic and foreign production were obtained from industry sources. Adjustments were made to place foreign production on the same basis as domestic production, that is, to exclude production not reflected in tax data.

EXHIBIT XXIII

SIMPLIFIED FLOWCHART FOR SBR
(SYNTHETIC RUBBER)



FEEDSTOCK COSTS USED RANGE FROM 1.20 TO 1.4¢. THE CRUDE OIL VALUE OF THIS AMOUNT ESTIMATED BY VARIOUS COMPANIES AND INDIVIDUALS RANGED FROM 22 TO 30 PERCENT. THE WIDE DIFFERENCES WERE ATTRIBUTED MAINLY TO THE FOLLOWING TWO FACTORS:

- METHODS OF ALLOCATING COSTS OF DIFFERENT OIL AND GAS FRACTIONS
- TRANSPORTATION COSTS

BENZENE	¢ PER LB OF BENZENE	% OF TOTAL COSTS
FEEDSTOCK	1.4	41
UTILITIES	0.5	15
LABOR AND OVERHEAD	0.1	3
CATALYST AND CHEMICALS	0.1	3
CAPITAL CHARGES	1.3	38
BENZENE	3.4	100

ETHYLENE	¢ PER LB OF ETHYLENE	% OF TOTAL COSTS
NET FEEDSTOCK	1.2	30
UTILITIES AND CHEMICALS	.8	20
LABOR AND OVERHEAD	.3	8
CAPITAL CHARGES	1.7	42
ETHYLENE	4.0	100

BUTANE	
UNIT COST OF BUTANE (¢)	1.4

ETHYLBENZENE	¢ PER LB OF ETHYLBENZENE	% OF TOTAL COST
ETHYLENE	0.8	18
BENZENE	2.5	56
UTILITIES	0.5	11
LABOR AND OVERHEAD	0.2	4
CAPITAL CHARGES	0.5	11
ETHYLBENZENE	4.5	100

STYRENE	¢ PER LB OF STYRENE		% OF TOTAL COST
ETHYLBENZENE		5.4	71
LESS CREDITS			
HYDROGEN	0.1		
BENZENE TOLUENE	0.1	(0.2)	
		5.2	69
UTILITIES		1.1	14
LABOR AND OVERHEAD		0.3	4
CAPITAL CHARGES		1.0	13
STYRENE		7.6	100

BUTADIENE	¢ PER LB OF BUTADIENE	% OF TOTAL COST
BUTANE	2.6	24
UTILITIES	0.7	7
CATALYST, CHEMICALS AND ROYALTIES	1.2	11
LABOR AND OVERHEAD	0.8	8
CAPITAL CHARGES	5.8	54
	11.1	104
HYDROGEN CREDIT	0.4	(4)
BUTADIENE	10.7	100

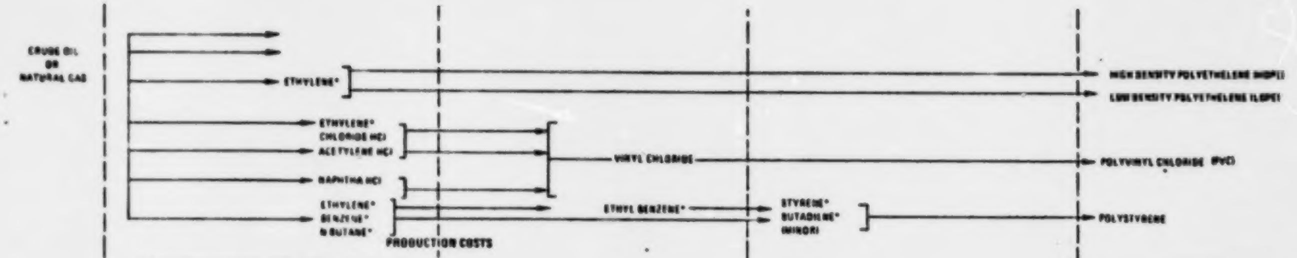
SBR SYNTHETIC RUBBER	¢ PER LB OF SBR	% OF TOTAL COSTS
STYRENE	2.3	10
BUTADIENE	8.7	38
UTILITIES	1.6	7
LABOR AND OVERHEAD	2.0	9
CATALYST AND CHEMICALS	2.6	11
CAPITAL CHARGES	5.8	25
	22.9	100

SOURCE: THE PETROCHEMICAL INDUSTRY MARKETS AND ECONOMICS, ALBERT V. G. HAHN, 1970.

① THE PRODUCTION COSTS REFLECT 1965 PRODUCTION FIGURES. MOST OF THE COSTS PRESENTED ARE REPRESENTATIVE OF 1971 PRICES. A COST REDUCTION IN SOME OF THE PRIMARY AND INTERMEDIATE SUBSTANCE COSTS HAS OCCURRED. THE FINAL PRICE OF SBR RUBBER, DUE TO INCREASES IN OTHER PRODUCTION COSTS, DOES NOT REFLECT A PRICE REDUCTION. THE RESULT OF THESE SHIFTS IS THE LESSENING OF THE EFFECT OF THE TAXES AND TAX INCENTIVES. THE FIGURES PRESENTED ARE WITHIN THE RANGE OF COST AND MATERIAL BALANCING PROVIDED BY INDUSTRY USING VARIOUS PRODUCTION PROCESSES.

EXHIBIT XXIV

SIMPLIFIED FLOWCHART
FOR SELECTED PLASTIC RESINS


CRUDE OIL
OR
NATURAL GAS
ETHYLENE*
HIGH DENSITY POLYETHYLENE (HDPE)
LOW DENSITY POLYETHYLENE (LDPE)
ETHYLENE*
CHLORIDE HCl
ACETYLENE HCl
NAPHTHA HCl
VINYL CHLORIDE
POLYVINYL CHLORIDE (PVC)
ETHYLENE*
BENZENE*
N BUTANE*
ETHYL BENZENE*
STYRENE*
BUTADIENE*
(MINOR)
POLYSTYRENE
PRODUCTION COSTS

* FEEDSTOCK COSTS OF 1.2¢ FOR ETHYLENE WAS USED.

ETHYLENE
ETHYLENE COST 4.0¢

AVERAGE RAW MATERIALS COSTS WERE DIFFICULT TO ISOLATE. BASED ON VARIETY OF MIXES, ESTIMATED MATERIALS TO CONSIST OF FROM 16 TO 30% FEEDSTOCK COSTS.

ALTERNATIVE OR COMBINATION MATERIAL COSTS	
ETHLENE	4.0¢
ACETYLENE	10.0¢
HCl	1.0¢
CHLORINE	2.5¢
NAPHTHA	1.0¢

MONOMER (VINYL CHLORIDE)	¢ PER LB OF MONOMER	% OF TOTAL COSTS
MATERIALS	3.457	58.80
UTILITIES	0.410	5.15
LABOR AND OVERHEAD	0.308	6.9
CAPITAL CHARGES	0.712	10.24
	5.978	

*FEEDSTOCK COSTS OF 1.2¢ TO 1.4¢ WERE USED

STYRENE
MONOMER COST – 7.5 (BASICALLY STYRENE 6)

	HIGH DENSITY POLYETHYLENE		LOW DENSITY POLYETHYLENE	
	¢ PER LB OF HDPE	% OF TOTAL COSTS	¢ PER LB OF LDPE	% OF TOTAL COSTS
ETHYLENE	4.3	31	4.8	27
UTILITIES	0.6	4	2.2	12
CATALYST AND CHEMICALS	0.8	6	1.4	8
LABOR AND OVERHEAD	1.1	8	1.1	6
CAPITAL CHARGES ①	7.2	51	8.4	47
	14.1	100	17.9	100
1971 PRICES (GROSS VALUE PER POUND)	13.4		12.8	

POLYVINYL CHLORIDE	¢ PER LB OF PVC	% OF TOTAL COSTS
MONOMER	7.1	57
UTILITIES, CATALYST AND CHEMICALS	1.4	11
LABOR AND OVERHEAD	0.7	6
CAPITAL CHARGES	3.3	26
	12.5	100
1971 PRICES (GROSS VALUE PER POUND)	13.2	

POLYSTYRENE	¢ PER LB OF POLYSTYRENE	% OF TOTAL COSTS
MONOMER	7.6	67
UTILITIES, CATALYST AND CHEMICALS	0.3	3
LABOR AND OVERHEAD	1.0	9
CAPITAL CHARGES	2.6	22
	11.5	100
1971 PRICES (GROSS VALUE PER POUND)	13.8	

SOURCE: THE PETROCHEMICAL INDUSTRY MARKETS AND ECONOMICS, ALBERT V. G. HAHN, 1970

* REFER TO EXHIBIT, XXV (SYNTHETIC RUBBER) SUBSTANCE PRODUCTION COSTS, FOR PRODUCTION COSTS AND OTHER COMMENTS

① THE PRODUCTION COSTS PRESENT 1965 FIGURES. INDUSTRY SUPPLIED LIMITED MATERIAL BALANCING DATA FOR PLASTIC RESINS. DECREASES IN RAW MATERIAL COSTS AND INCREASES IN PRODUCTION COST ACCOUNT FOR THE DIFFERENCES BETWEEN PRODUCTION COSTS AND 1971 PRICES.

- Annual cost and percentage depletion totals applicable to foreign and domestic production were provided by industry sources. The excess of percentage depletion over cost reportedly attributable to petroleum and natural production was estimated on the basis of the assmption that the amount of depletion claimed would be proportional to the well head value of the petroleum and natural gas produced in a given period.

- The depletion tax benefit was estimated by multiplying the excess of percentage depletion by 0.48, the corporate income tax rate.

- The depletion tax benefit used in estimating total tax impacts represents a weighted average of domestic and foreign benefits.

Minimum Tax On Tax Preference Items (Depletion)

The procedures used to estimate the tax impact of the minimum tax related to the depletion allowance were as follows:

- The total amount of taxes paid on preference items was obtained from industry sources. (The minimum tax did not become effective until 1970). Deductions relating to specific preference items were estimated and a proportionate share of the taxes paid was allocated to each.

- The estimated minimum tax attributable to the depletion allowance was allocated between natural gas and crude petroleum output on the same basis as the depletion allowance.

- **Foreign Tax Credits**

  The procedures used in estimating tax benefits derived from foreign tax credits were as follows:

  - The total amounts of foreign tax credits taken annually were obtained from industry sources

  - Foreign tax credits attributable to crude petroleum and natural gas produced were estimated on the basis of the assumption that such credits would be proportional to the share of total foreign revenues attributable to petroleum and natural gas production.

  - The tax benefit provided by the foreign tax credit was computed as 48 percent of the credit taken.

- **Tax Treatment of Exploration and Development Costs**

  The benefits associated with the tax treatment of exploration, intangible drilling, and development costs were estimated on the basis of data regarding actual expenditures obtained from industry sources. The basis for computing the value of the tax benefit was defined as the net reduction in the current year's tax liability achieved through treating such costs as expenses as opposed to capital expenditures. The dollar value of the tax benefit was considered to be the time value of the deferred tax liability discounted at 7 percent over a period of ten years. The discount rate used reflects the estimated cost of producer borrowing while the time period used (10 years) represents the estimated amortization period were expenditures capitalized.

- **State Taxes**

  The impact of state taxes on crude petroleum and natural gas production costs was estimated on the basis of severance and production taxes actually paid by those producers included in the study. The taxes paid were allocated between natural gas and crude petroleum output on the basis of gross revenues attributable to each. The net tax impact was computed as 48 percent of the taxes paid.

4. ESTIMATED TAX BENEFITS ARE PROBABLY NOT SUFFICIENT TO INFLUENCE PRODUCER RAW MATERIAL CHOICES

Exhibit XXV, following this page, summarizes the impact of the discriminatory taxes and tax benefits evaluated on the cost of producing crude petroleum and natural gas for the period 1969-1971. As indicated on the Exhibit, the percentage depletion allowance accounts for most of the tax benefits obtained. The maximum net reduction in the cost per barrel of crude petroleum computed (weighted average basis) is \$0.318 after taxes for 1969, equal to approximately 12 percent of the prevailing crude oil price. On a pretax basis, the maximum computed net cost reduction would be \$0.636 per barrel, equal to about 24 percent of the prevailing crude oil price. For natural gas, the maximum computed tax benefit is \$0.011 per MCF after taxes for 1969, equal to about 6.6 percent of the prevailing natural gas price. On a pretax basis the benefit would be \$0.022 per MCF, equal to about 13.2 percent of the prevailing price.

Exhibit XXVI summarizes the impacts of the computed tax impacts on the cost of producing SBR rubber in 1971 using a crude petroleum base. Note that the impact will vary depending on the share of feedstock costs attributable to crude petroleum costs. Estimates of the share of crude petroleum costs in feedstock costs ranged from 30 percent to 70 percent. This wide range is attributable mainly to differing methods of distributing costs of petroleum fractions and transportation costs.

Assuming a 70 percent cost share, the impact of the taxes and tax benefits on the cost of producing SBR rubber would be 0.7 cents per pound, equal to 1.4 percent of the prevailing price per pound of SBR rubber.

EXHIBIT XXV

IMPACT OF SELECTED TAXES AND TAX BENEFITS ON THE COST OF PRODUCING CRUDE OIL AND NATURAL GAS

DOLLARS & PERCENT OF PRICE (1)

U.S. TAX TREATMENT	OIL (PER BARREL)						NATURAL GAS (MCF)					
	1971		1970		1969		1971		1970		1969	
	$	%	$	%	$	%	$	%	$	%	$	%
DEPLETION* – DOMESTIC FOREIGN ② WEIGHTED AVERAGE	0.273 0.211 0.249	8.1 7.5-10.8 7.9- 9.0	0.258 0.199 0.231	8.1 8.0-10.8 7.9 8.6	0.381 0.317 0.305	9.7 13.5-18.1 10.1-11.8	0.015 N/A N/A	8.1	0.014 N/A N/A	8.2	0.015 N/A N/A	9.0
MINIMUM TAX RELATED TO DEPLETION* DOMESTIC	(0.042)	(1.2)	(0.035)	(1.1)	NOT APPLICABLE		(0.002)	(1.1)	(0.002)	(1.2)	NOT APPLICABLE	
TAXES PAID OR DEEMED PAID TO FOREIGN GOVERNMENTS	0.128	4.6- 6.6	0.102	4.1- 5.5	0.072	3.1- 4.1	N/A		N/A		N/A	
EXPLORATION AND DEVELOPMENT EXPENSES* – DOMESTIC FOREIGN WEIGHTED AVERAGE	0.017 0.010 0.014	.5 .4- .5 .4- .5	0.019 0.013 0.017	.6 .5- .7 .6	0.021 0.013 0.018	.7 .6- .7 .6- .7	0.002 N/A N/A	1.1	0.002 N/A N/A	1.2	0.002 N/A N/A	1.2
STATE TAXES	(0.056-0.071)	(1.7- 2.7)	(0.053-0.068)	(1.7- 2.7)	(0.051-0.069)	1.7- 2.2	(0.006-0.008)	(3.4- 4.4)	(0.006-0.008)	(3.5- 4.7)	(0.006-0.007)	(3.8-4.2)
	$	%	$	%	$	%	$	%	$	%	$	%
TOTAL IMPACT DOMESTIC FOREIGN	0.252-0.261 0.172-0.192 .349	8.0- 9.4 5.2- 5.7 12.5-17.9	0.286-0.296 0.174-0.189 .314	9.8-11.0 5.5-5.9 12.6-17.0	0.307-0.318 0.253-0.271 .402	10.2-12.3 8.2- 8.8 17.1-23.0	.007- .009	3.8- 4.9	.006- .008	3.5- 4.7	.010- .011	6.0- 6.6

① PRICE DATA

		DOMESTIC	FOREIGN	AVERAGE
CRUDE OIL: (PER BARREL)	1972	3.38	2.00-2.90	
	1971	3.39	1.95-2.80	2.77-3.14
	1970	3.18	1.85-2.50	2.70-2.93
	1969	3.09	1.75-2.35	2.59-3.02
NATURAL GAS (PER MCF)	1972	.186		
	1971	.182		
	1970	.171		
	1969	.167		

SOURCE: BOOZ, ALLEN & HAMILTON, INC.

② U.S. IMPORTS 3 TO 5 PERCENT OF THE NATURAL GAS SUPPLY, PRIMARILY FROM CANADA.

Note: Impacts are shown on an after-tax basis

APPROXIMATELY 60% OF U.S. PRODUCTION OF CRUDE OIL IS COVERED IN THIS EXHIBIT

EXHIBIT XXVI

IMPACT OF SELECTED TAXES AND TAX BENEFITS ON THE COST OF PRODUCING SBR RUBBER - 1971

(cents per pound)

Percent of Feedstock Costs Attributable to Crude Oil Costs	SBR Synthetic Rubber Price per Pound 1971	Feedstock Cost Per Pound of SBR	Tax Impact Per Pound of SBR		Tax Impact of SBR Price	
			After Tax	Before Tax	After Tax	Before Tax
70%	23.6	1.88	.17	.34	0.7	1.4
30%	23.6	.76	.07	.14	0.2	0.4

Note: Impacts are shown on an after-tax basis

Exhibit XXVII, following this page, summarizes the impact of the tax elements analyzed on the cost of producing selected plastic resins in 1971 from petroleum based feedstocks. Again, assuming a 70 percent share of crude petroleum costs in feedstock costs, the pretax net cost reduction attributable to the taxes and tax benefits evaluated is equal to about 1 percent of prevailing resin prices.

The tax impacts assuming use of natural gas based feedstocks or mixed based feedstocks are of the same order as those discussed above.

Because of the significant technical barriers standing in the way of increased secondary materials use in producing synthetic rubber and plastics, it can be concluded on a qualitative basis that the incremental cost of using such materials would be very high. The magnitude of the tax benefits computed above, representing about one percent or less of rubber and resin prices are not likely in themselves to be sufficient to cause producers to consider substitution of reclaimed rubber or plastics for virgin or raw materials.

* * *

EXHIBIT XXVII

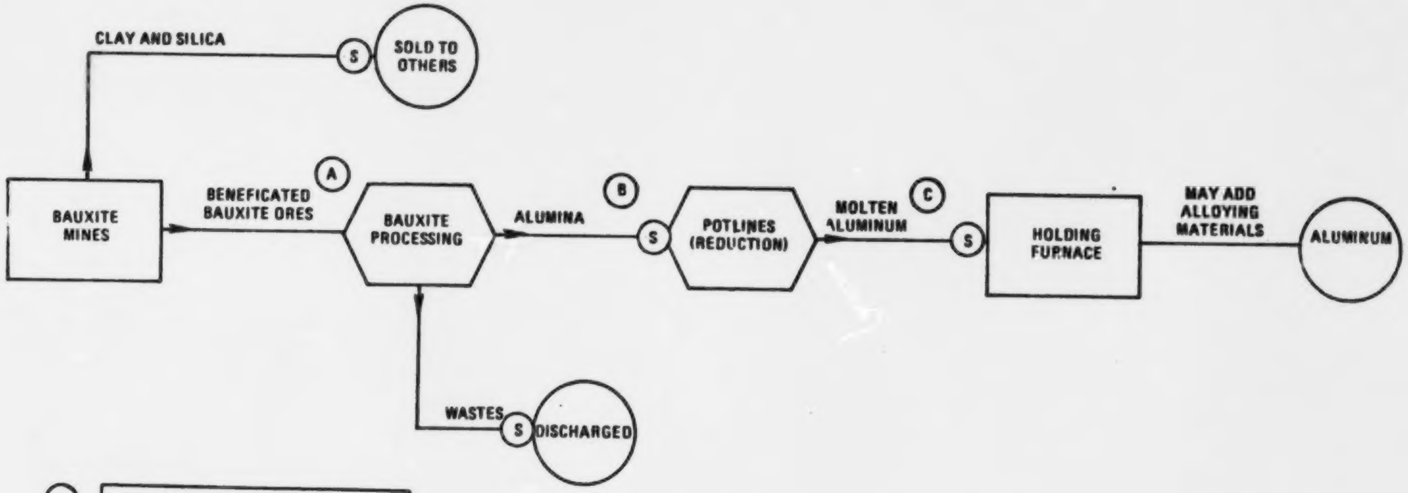
IMPACT OF SELECTED TAXES AND TAX BENEFITS ON THE COST OF PRODUCING SELECTED PLASTICS RESINS - 1971

(cents per pound)

Plastic Resins	Percent of Feedstock Costs Attributable to Crude Oil Costs	1971 Resin Price	Estimated Feedstock Cost Per Pound of Resin	Tax Impact Per Pound of Resin		Tax Impact as % of Resin Price	
				After Tax	Before Tax	After Tax	Before Tax
High Density Polyethelene	70%	13.4	.80	.07	0.14	0.52	1.04
	30%	13.4	.40	.04	0.08	0.27	0.54
Low Density Polyethelene	70%	12.8	.64	.06	0.12	0.47	0.94
	30%	12.8	.26	.02	0.04	0.16	0.32
Polyvinyl Chloride		13.2	.31	.03	0.06	0.23	0.46
Polystrene			1.56	.14	0.28		
	70%	13.8	1.09	.09	0.18	0.72	1.42
	30%	13.8	.39	.04	0.08	0.25	0.50

Note: Impacts are shown on an after-tax basis

ALUMINUM MANUFACTURING UTILIZING VIRGIN MATERIALS


CLAY AND SILICA
S
SOLD TO OTHERS
BAUXITE MINES
BENEFICATED BAUXITE ORES
Ⓐ
BAUXITE PROCESSING
ALUMINA
Ⓑ
S
POTLINES (REDUCTION)
MOLTEN ALUMINUM
Ⓒ
S
HOLDING FURNACE
MAY ADD ALLOYING MATERIALS
ALUMINUM
WASTES
S
DISCHARGED

Ⓐ BAUXITE ORES ARE PROCESSED AT THE MINES OR ARE ALSO SHIPPED FOR PROCESSING ELSEWHERE

Ⓑ
2 TONS OF BAUXITE ORE FOR 1 TON OF ALUMINA
.2 TONS OF COAL FOR 1 TON OF ALUMINA
.1 TONS OF FUEL OIL FOR 1 TON OF ALUMINA
.2 TONS OF SODA FOR 1 TON OF ALUMINA
.05 TONS OF LIME FOR 1 TON OF ALUMINA

SOURCE: ALUMINUM, McGRAW-HILL, INC., 1969

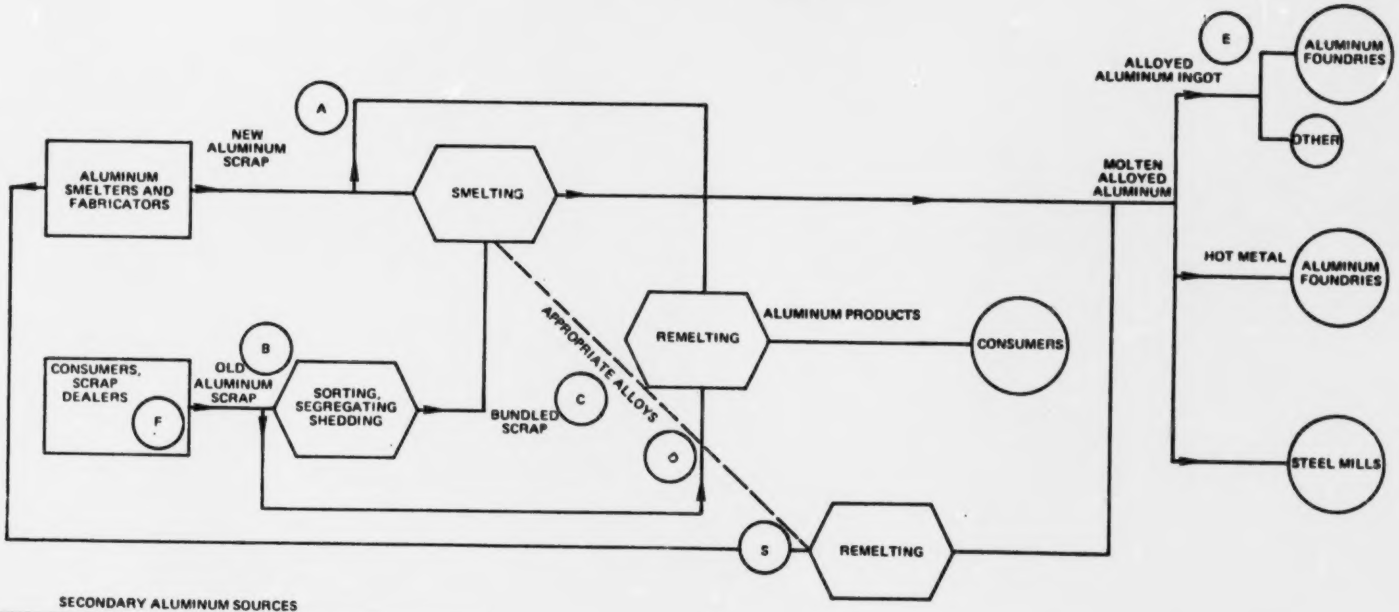
Ⓒ
2 TONS OF ALUMINA FOR 1 TON OF ALUMINUM
.6 TONS OF BAKED CARBON FOR 1 TON OF ALUMINUM
.03 TONS OF CRYOLITE FOR 1 TON OF ALUMINUM
.04 TONS OF ALUMINUM FLUORIDE FOR 1 TON OF ALUMINUM

SOURCE: ALUMINUM, McGRAW-HILL, INC., 1969

S = SHIPPED

APPENDIX A (2)

SECONDARY ALUMINUM MANUFACTURING
ALUMINUM DIE CASTING


ALUMINUM SMELTERS AND FABRICATORS
NEW ALUMINUM SCRAP
A
SMELTING
CONSUMERS, SCRAP DEALERS
F
OLD ALUMINUM SCRAP
B
SORTING, SEGREGATING SHEDDING
BUNDLED SCRAP
C
APPROPRIATE ALLOYS
D
REMELTING
ALUMINUM PRODUCTS
CONSUMERS
S
REMELTING
MOLTEN ALLOYED ALUMINUM
ALLOYED ALUMINUM INGOT
E
ALUMINUM FOUNDRIES
OTHER
HOT METAL
ALUMINUM FOUNDRIES
STEEL MILLS

SECONDARY ALUMINUM SOURCES

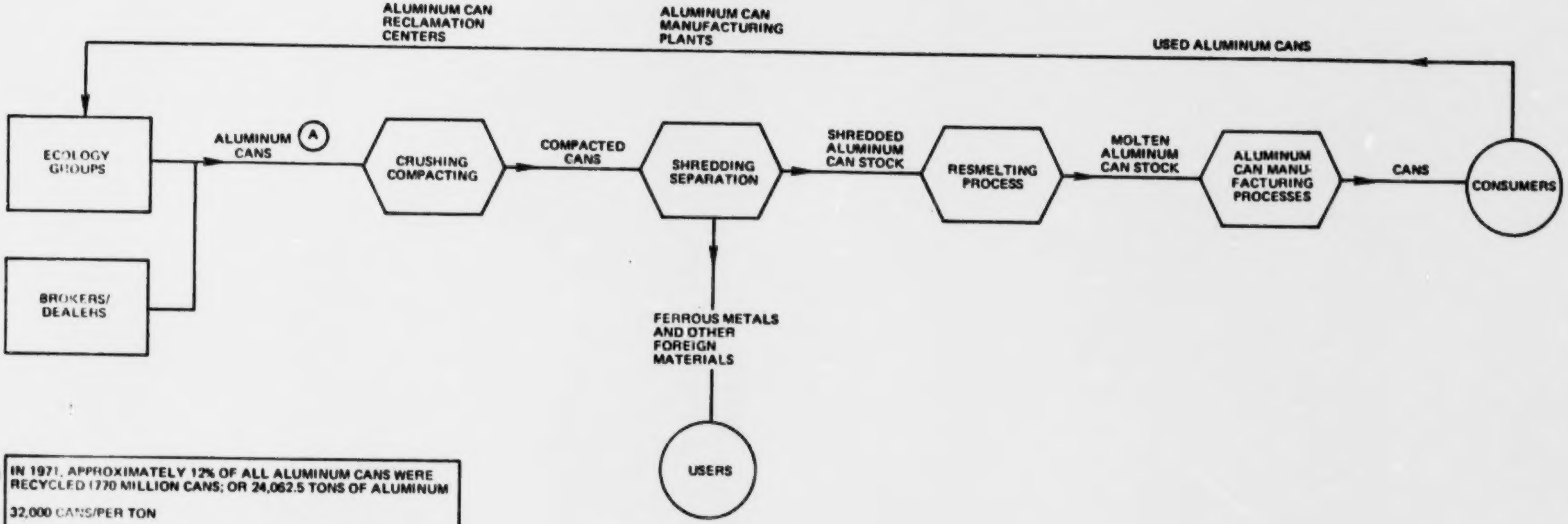
A	NEW SCRAP: 82% APPROX 17% BORINGS AND TURNINGS APPROX 51% CLIPPINGS AND FORGINGS APPROX 14% RESIDUES
B	OLD SCRAP: 18% APPROX 11.5% OBSOLETE ALUMINUM-BEARING PRODUCTS APPROX 6.5% SWEATED PIG ALUMINUM
C	BUNDLES, WHERE POSSIBLE, ARE SHIPPED ACCORDING TO ALLOY CONTENT
D	BOTH PRIMARY AND SECONDARY SMELTERS PRODUCE PURE ELECTROLYTIC TYPE ALUMINUM, BUT SUCH OUTPUT IS OF MINOR IMPORTANCE TO THE SECONDARY INDUSTRY. ALLOYS ARE ALMOST ALWAYS ADDED IF NOT ALREADY PRESENT IN ALUMINUM SCRAP IN CORRECT QUANTITIES.
E	87% OF SECONDARY SMELTER OUTPUT GOES TO FOUNDRIES; OVER 60% OF OUTPUT IS USED IN DIE CASTING APPLICATIONS.
F	DEALER/PROCESSORS PROCESS APPROXIMATELY 70% OF RE-CYCLED ALUMINUM

Ⓢ SHIPPED

SOURCE: U.S. BUREAU OF MINES

APPENDIX A (3)

SECONDARY ALUMINUM MANUFACTURING
ALUMINUM CAN RECYCLING

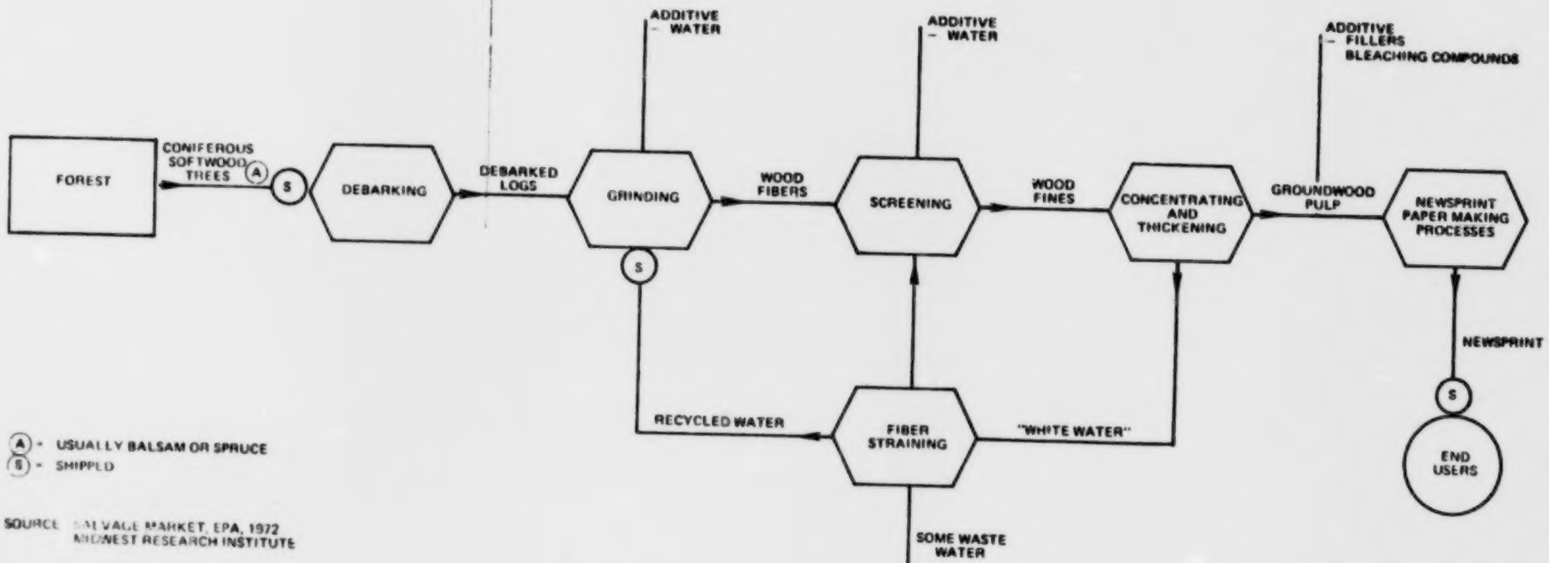

ALUMINUM CAN RECLAMATION CENTERS
ALUMINUM CAN MANUFACTURING PLANTS
USED ALUMINUM CANS
ECOLOGY GROUPS
BROKERS/ DEALERS
ALUMINUM CANS Ⓐ
CRUSHING COMPACTING
COMPACTED CANS
SHREDDING SEPARATION
SHREDDED ALUMINUM CAN STOCK
RESMELTING PROCESS
MOLTEN ALUMINUM CAN STOCK
ALUMINUM CAN MANU-FACTURING PROCESSES
CANS
CONSUMERS
FERROUS METALS AND OTHER FOREIGN MATERIALS
USERS

A IN 1971, APPROXIMATELY 12% OF ALL ALUMINUM CANS WERE RECYCLED (770 MILLION CANS; OR 24,062.5 TONS OF ALUMINUM

32,000 CANS/PER TON

SOURCE: ALUMINUM ASSOCIATION

NEWSPRINT MANUFACTURING UTILIZING VIRGIN GROUNDWOOD PULP


FOREST
CONIFEROUS SOFTWOOD TREES (A)
(S)
DEBARKING
DEBARKED LOGS
ADDITIVE - WATER
GRINDING
(S)
WOOD FIBERS
ADDITIVE - WATER
SCREENING
WOOD FINES
CONCENTRATING AND THICKENING
ADDITIVE - FILLERS - BLEACHING COMPOUNDS
GROUNDWOOD PULP
NEWSPRINT PAPER MAKING PROCESSES
NEWSPRINT
(S)
END USERS
RECYCLED WATER
FIBER STRAINING
"WHITE WATER"
SOME WASTE WATER
DISPOSAL
(A) - USUALLY BALSAM OR SPRUCE
(S) - SHIPPED

SOURCE: SALVAGE MARKET, EPA, 1972
MIDWEST RESEARCH INSTITUTE

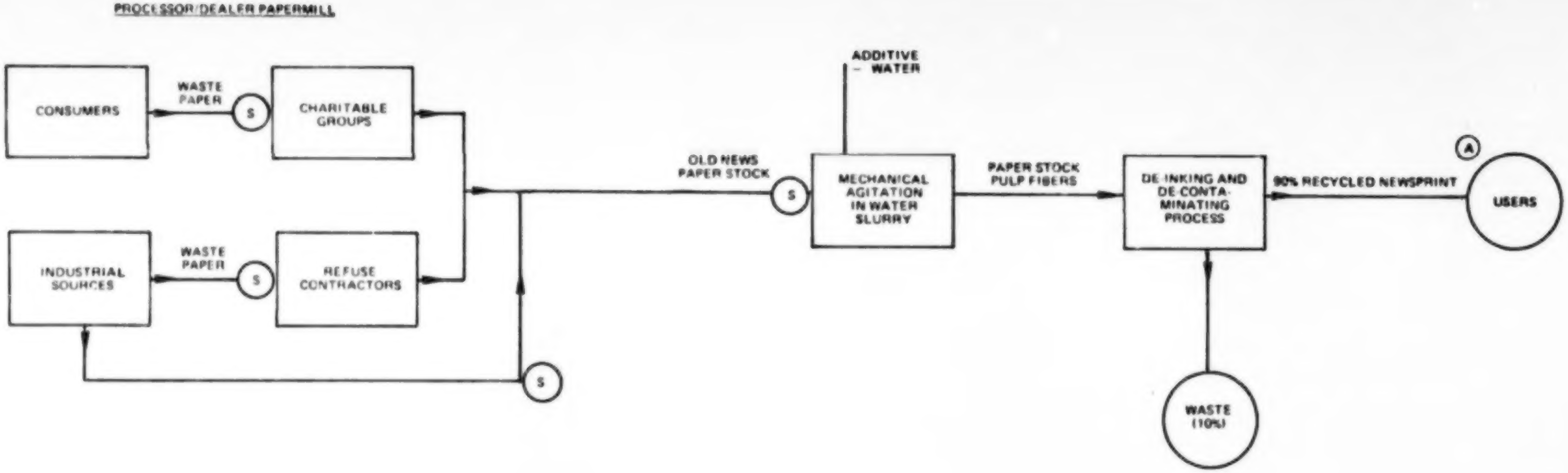
MATERIAL REQUIREMENTS

1. CORD ROUNDWOOD (1.2 TONS) PER TON OF NEWSPRINT

NOTE: NEWSPRINT NORMALLY IS PRODUCED USING 75-80% GROUNDWOOD AND 20-25% SEMI-BLEACHED FIBER HOWEVER, ASSUMING THE ABOVE MATERIAL REQUIREMENTS PROVIDES SUFFICIENT ACCURACY FOR THIS ANALYSIS

APPENDIX A (5)

NEWSPRINT MANUFACTURING UTILIZING SECONDARY MATERIALS


PROCESSOR/DEALER PAPERMILL
CONSUMERS
WASTE PAPER
S
CHARITABLE GROUPS
INDUSTRIAL SOURCES
WASTE PAPER
S
REFUSE CONTRACTORS
S
OLD NEWS PAPER STOCK
S
ADDITIVE – WATER
MECHANICAL AGITATION IN WATER SLURRY
PAPER STOCK PULP FIBERS
DE-INKING AND DE-CONTAMINATING PROCESS
WASTE (10%)
90% RECYCLED NEWSPRINT
A
USERS

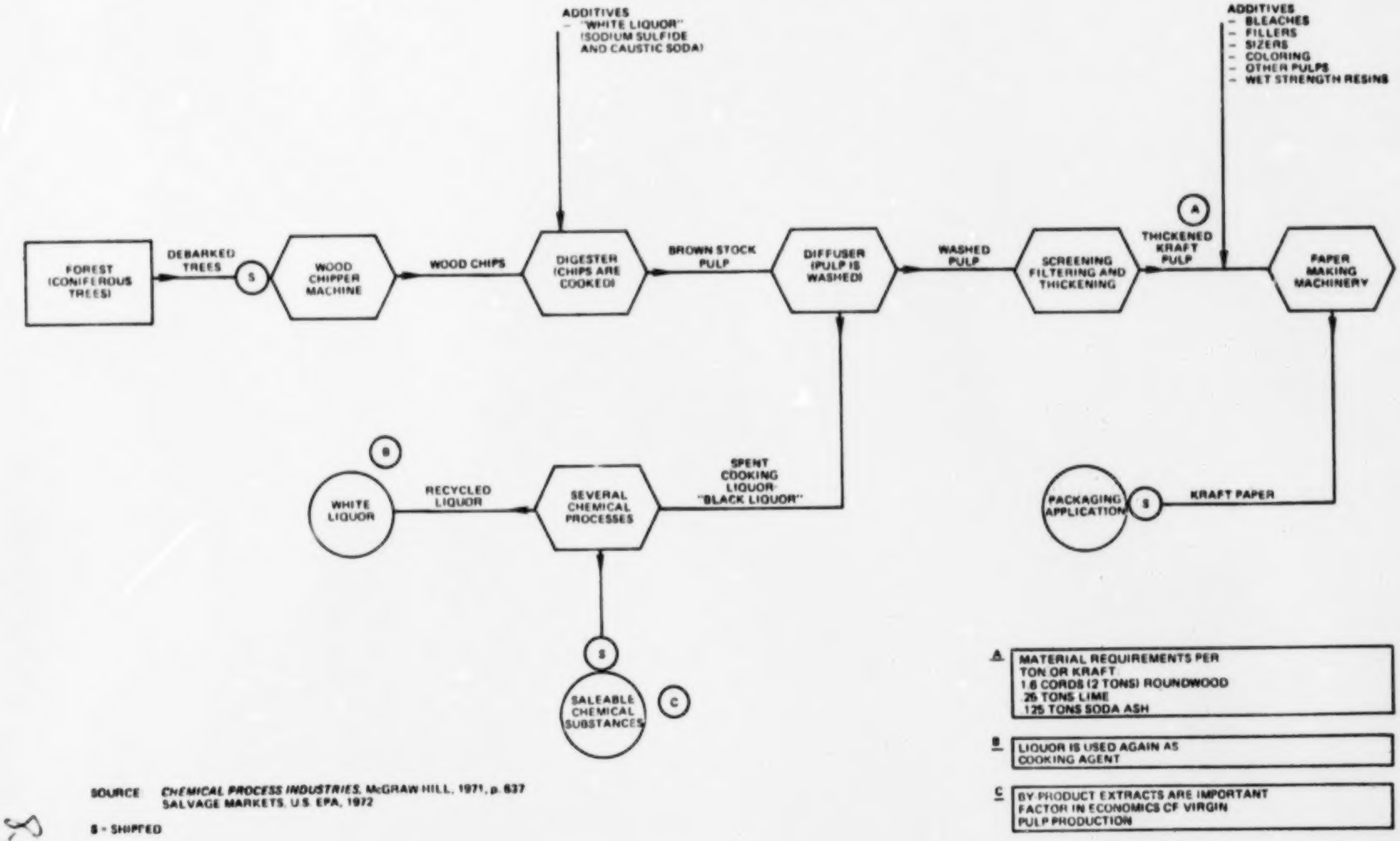
A — MATERIAL REQUIREMENTS 1.19 TONS OF PAPERSTOCK FOR 1 TON OF NEWSPRINT

SOURCE: CHEMICAL PROCESS INDUSTRIES, McGRAW HILL, 1971

SOURCE: REPORTS TO COUNCIL ON ENVIRONMENTAL QUALITY MIDWEST RESEARCH INSTITUTE, 1971

Ⓢ - SHIPPED

INTEGRATED KRAFT PAPER MANUFACTURING UTILIZING VIRGIN MATERIALS


FOREST (CONIFEROUS TREES)
DEBARKED TREES
S
WOOD CHIPPER MACHINE
WOOD CHIPS
ADDITIVES
– "WHITE LIQUOR" (SODIUM SULFIDE AND CAUSTIC SODA)
DIGESTER (CHIPS ARE COOKED)
BROWN STOCK PULP
DIFFUSER (PULP IS WASHED)
WASHED PULP
SCREENING FILTERING AND THICKENING
A
THICKENED KRAFT PULP
ADDITIVES
– BLEACHES
– FILLERS
– SIZERS
– COLORING
– OTHER PULPS
– WET STRENGTH RESINS
PAPER MAKING MACHINERY
KRAFT PAPER
S
PACKAGING APPLICATION
B
WHITE LIQUOR
RECYCLED LIQUOR
SEVERAL CHEMICAL PROCESSES
SPENT COOKING LIQUOR "BLACK LIQUOR"
S
SALEABLE CHEMICAL SUBSTANCES
C

A MATERIAL REQUIREMENTS PER TON OR KRAFT
1.6 CORDS (2 TONS) ROUNDWOOD
.25 TONS LIME
.125 TONS SODA ASH

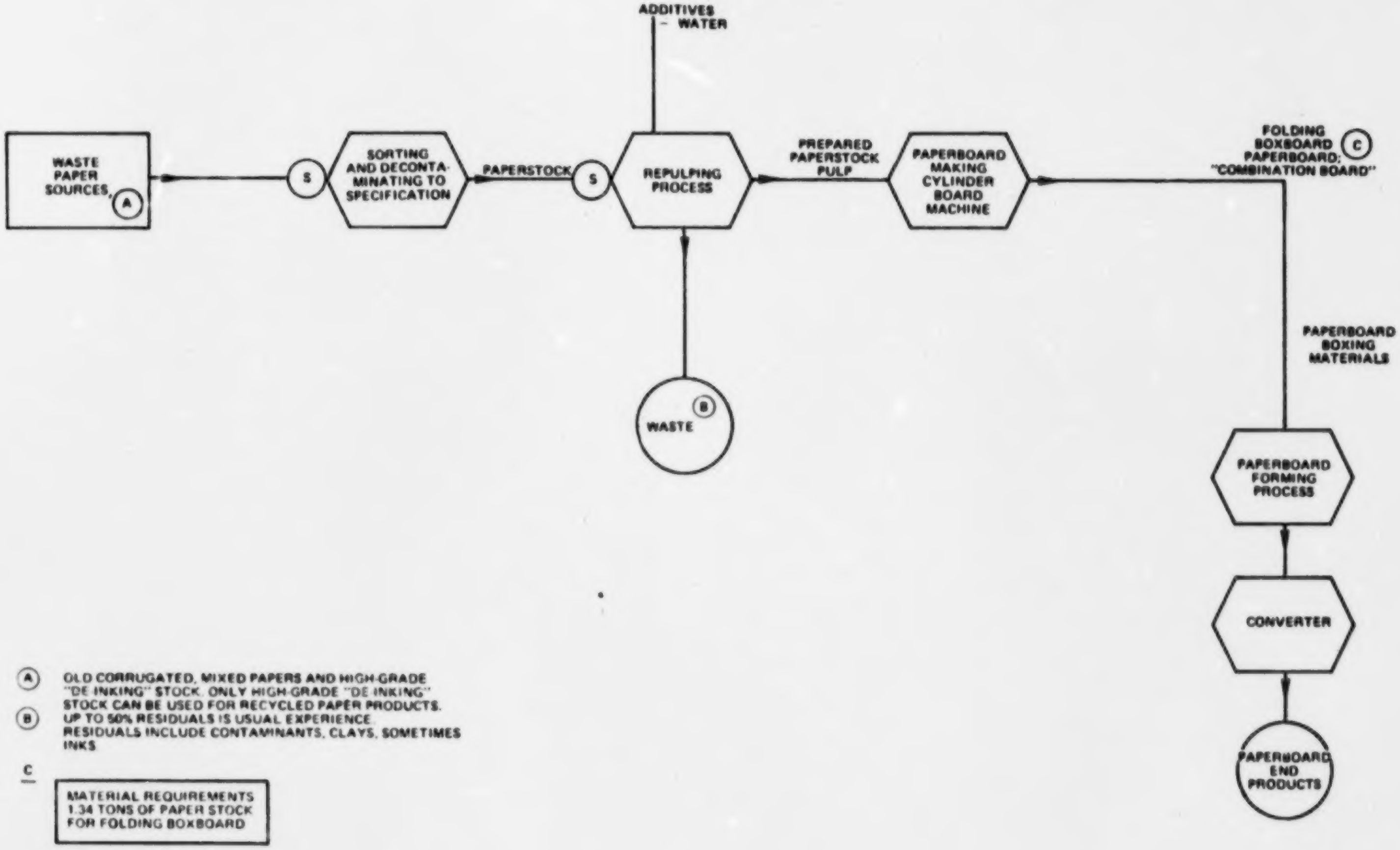
B LIQUOR IS USED AGAIN AS COOKING AGENT

C BY PRODUCT EXTRACTS ARE IMPORTANT FACTOR IN ECONOMICS CF VIRGIN PULP PRODUCTION

SOURCE *CHEMICAL PROCESS INDUSTRIES*, McGRAW HILL, 1971, p. 637
SALVAGE MARKETS, U.S. EPA, 1972

S - SHIPPED

RECYCLED PAPER STOCK/PAPERBOARD MANUFACTURING UTILIZING SECONDARY MATERIALS


ADDITIVES
– WATER
WASTE PAPER SOURCES, Ⓐ
S
SORTING AND DECONTAMINATING TO SPECIFICATION
PAPERSTOCK
S
REPULPING PROCESS
PREPARED PAPERSTOCK PULP
PAPERBOARD MAKING CYLINDER BOARD MACHINE
FOLDING BOXBOARD Ⓒ
PAPERBOARD;
"COMBINATION BOARD"
PAPERBOARD BOXING MATERIALS
WASTE Ⓑ
PAPERBOARD FORMING PROCESS
CONVERTER
PAPERBOARD END PRODUCTS

Ⓐ OLD CORRUGATED, MIXED PAPERS AND HIGH-GRADE "DE INKING" STOCK. ONLY HIGH-GRADE "DE INKING" STOCK CAN BE USED FOR RECYCLED PAPER PRODUCTS.

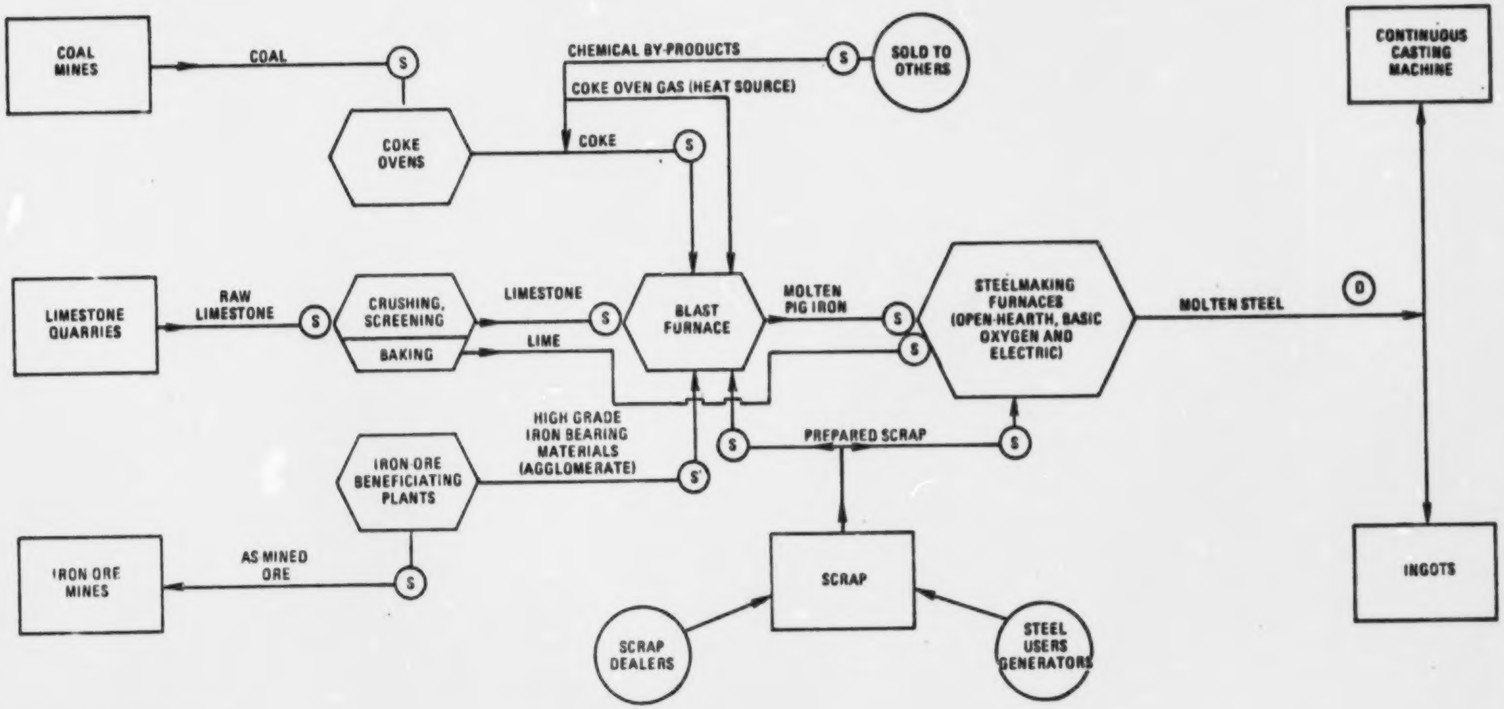
Ⓑ UP TO 50% RESIDUALS IS USUAL EXPERIENCE. RESIDUALS INCLUDE CONTAMINANTS, CLAYS, SOMETIMES INKS

C MATERIAL REQUIREMENTS 1.34 TONS OF PAPER STOCK FOR FOLDING BOXBOARD

SOURCE: MRI, COMBINATION, 1972

S - SHIPPED

STEEL PRODUCTION USING VIRGIN AND SECONDARY MATERIAL


COAL MINES
COAL
S
CHEMICAL BY-PRODUCTS
S
SOLD TO OTHERS
COKE OVEN GAS (HEAT SOURCE)
COKE OVENS
COKE
S
CONTINUOUS CASTING MACHINE
LIMESTONE QUARRIES
RAW LIMESTONE
S
CRUSHING, SCREENING
BAKING
LIMESTONE
LIME
S
BLAST FURNACE
MOLTEN PIG IRON
S
S
STEELMAKING FURNACES (OPEN-HEARTH, BASIC OXYGEN AND ELECTRIC)
MOLTEN STEEL
D
HIGH GRADE IRON BEARING MATERIALS (AGGLOMERATE)
IRON ORE BENEFICIATING PLANTS
S
S
PREPARED SCRAP
S
IRON ORE MINES
AS MINED ORE
S
SCRAP
SCRAP DEALERS
STEEL USERS GENERATORS
INGOTS

MATERIAL REQUIREMENTS

MATERIAL REQUIREMENTS PER TON OR PRIMARY RAW STEEL	TONS
IRON ORE	1.20
COAL	0.60
LIMESTONE	0.18
SCRAP	0.45

OPEN HEARTH – 29.5% OF 1971 PRODUCTION

BASIC OXYGEN – 53.1% OF 1971 PRODUCTION

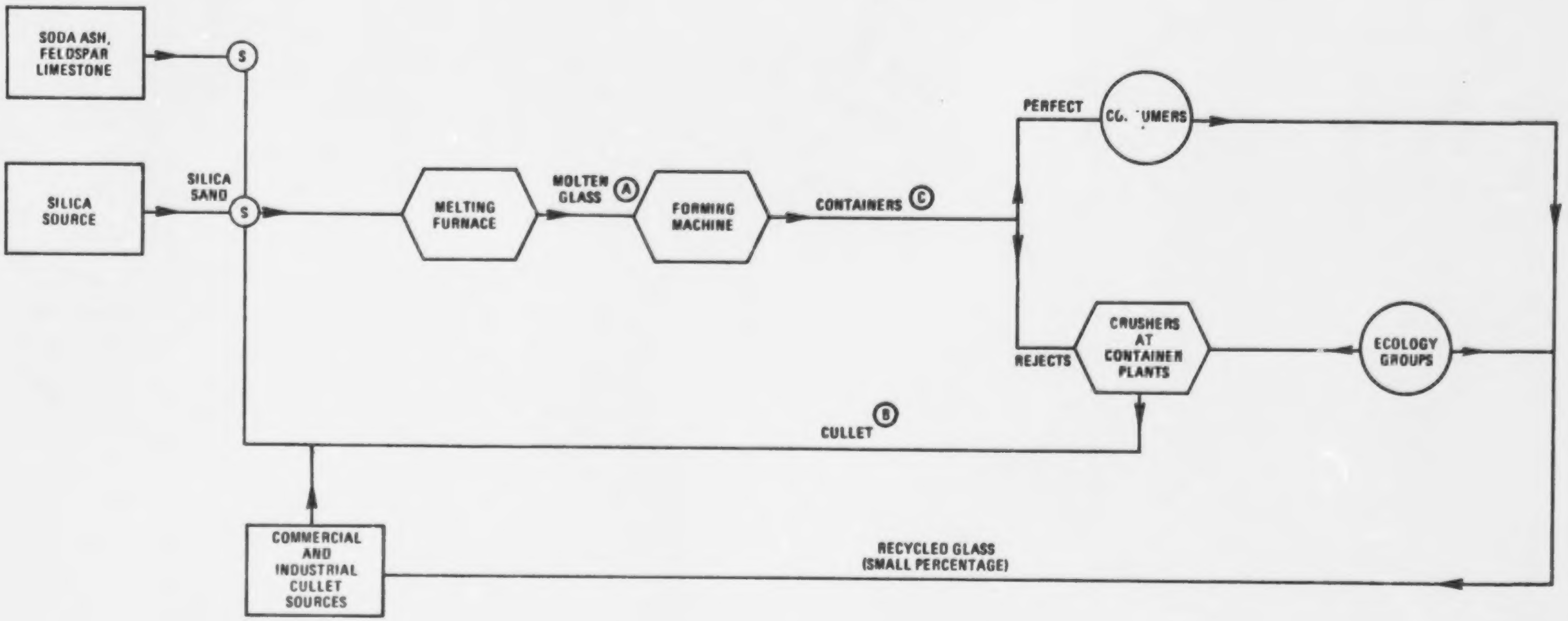
ELECTRIC – 17.4% OF 1971 PRODUCTION

SOURCE: MINERAL YEARBOOK, U.S. BUREAU OF MINES, 1971

S = SHIPPED

APPENDIX A (9)

GLASS MANUFACTURING UTILIZING VIRGIN AND SECONDARY MATERIALS


SODA ASH, FELDSPAR LIMESTONE
SILICA SOURCE
S
SILICA SAND
S
MELTING FURNACE
MOLTEN GLASS Ⓐ
FORMING MACHINE
CONTAINERS Ⓒ
PERFECT
CONSUMERS
REJECTS
CRUSHERS AT CONTAINER PLANTS
ECOLOGY GROUPS
CULLET Ⓑ
COMMERCIAL AND INDUSTRIAL CULLET SOURCES
RECYCLED GLASS (SMALL PERCENTAGE)

Ⓐ 1,299 LBS. OF SILICA FOR 1 TON OF GLASS
426 LBS. OF SODA ASH FOR 1 TON OF GLASS
157 LBS. OF FELDSPAR FOR 1 TON OF GLASS
358 LBS. OF LIMESTONE FOR 1 TON OF GLASS

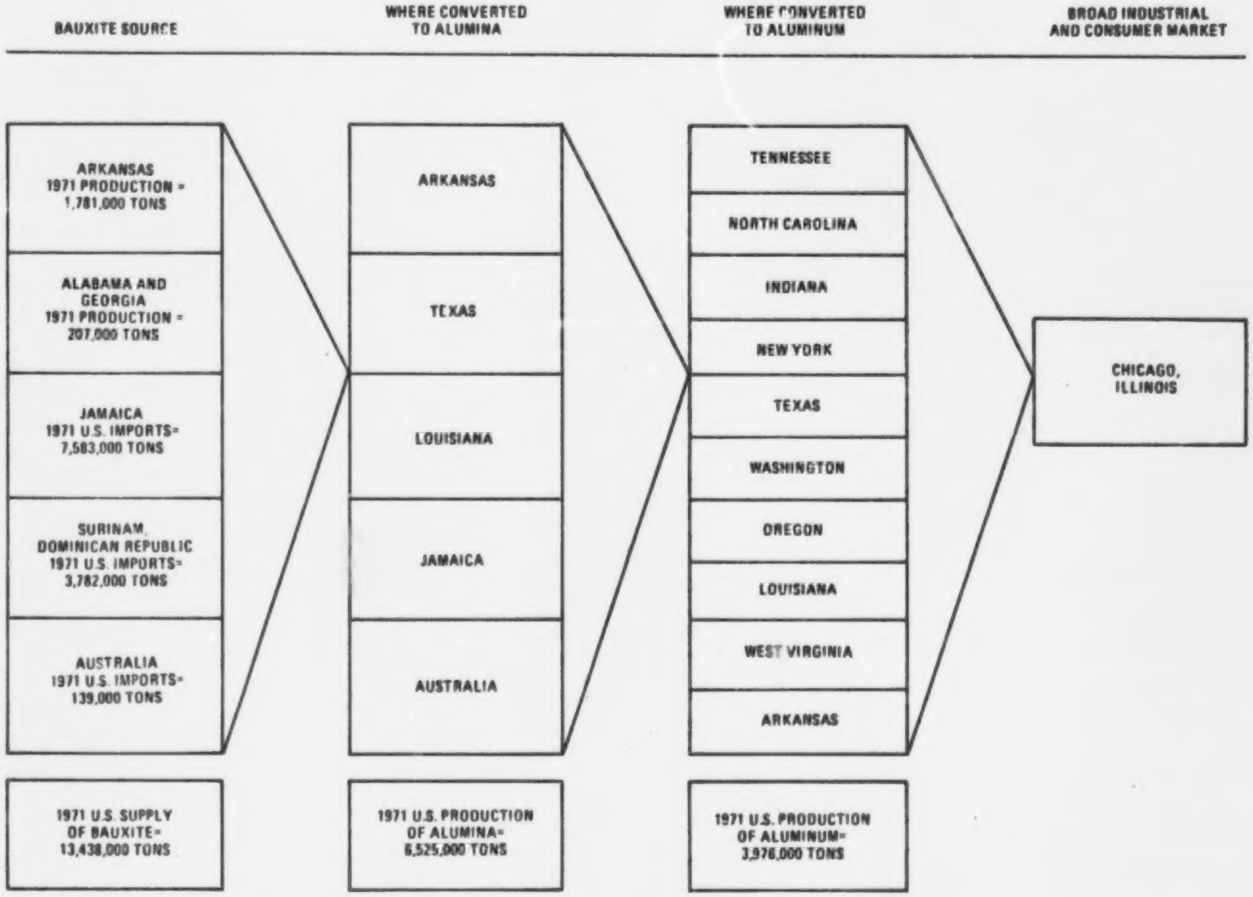
Ⓒ AFTER PROCESSING, CONTENT IS:
1,460 LBS. OF SILICA IN 1 TON OF GLASS
276 LBS. OF SODA ASH IN 1 TON OF GLASS
26 LBS. OF FELDSPAR IN 1 TON OF GLASS
204 LBS. OF LIMESTONE IN 1 TON OF GLASS

Ⓑ CULLET MAKES UP 10 - 15% OF AVERAGE BATCH THAT GOES INTO MELTING FURNACE

SOURCE: GLASS INDUSTRY

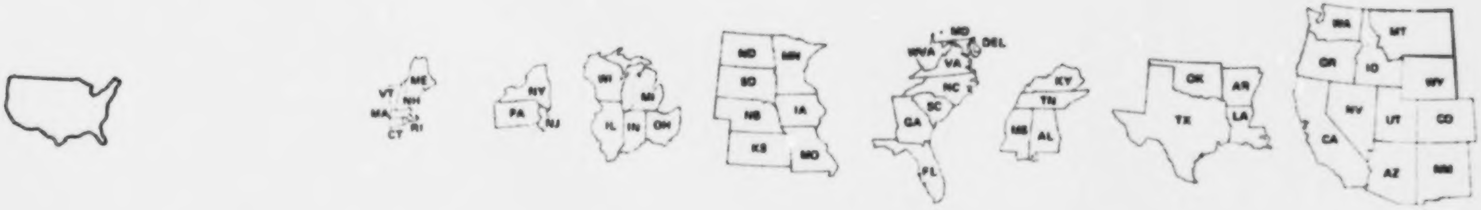
APPENDIX B (1)

SOURCES OF BAUXITE, ALUMINA AND ALUMINUM FOR THE U. S. MARKET


BAUXITE SOURCE
WHERE CONVERTED TO ALUMINA
WHERE CONVERTED TO ALUMINUM
BROAD INDUSTRIAL AND CONSUMER MARKET
ARKANSAS 1971 PRODUCTION = 1,781,000 TONS
ALABAMA AND GEORGIA 1971 PRODUCTION = 207,000 TONS
JAMAICA 1971 U.S. IMPORTS= 7,583,000 TONS
SURINAM, DOMINICAN REPUBLIC 1971 U.S. IMPORTS= 3,782,000 TONS
AUSTRALIA 1971 U.S. IMPORTS= 139,000 TONS
1971 U.S. SUPPLY OF BAUXITE= 13,438,000 TONS
ARKANSAS
TEXAS
LOUISIANA
JAMAICA
AUSTRALIA
1971 U.S. PRODUCTION OF ALUMINA= 6,525,000 TONS
TENNESSEE
NORTH CAROLINA
INDIANA
NEW YORK
TEXAS
WASHINGTON
OREGON
LOUISIANA
WEST VIRGINIA
ARKANSAS
1971 U.S. PRODUCTION OF ALUMINUM= 3,976,000 TONS
CHICAGO, ILLINOIS

SOURCE: BUREAU OF MINES, U.S. DEPT. OF THE INTERIOR

SOURCES OF TIMBER FOR THE U. S. MARKET


VT
ME
NH
MA
RI
CT
NY
PA
NJ
WI
MI
IL
IN
OH
ND
MN
SD
NB
IA
KS
MO
MD
DEL
WVA
VA
NC
SC
GA
FL
KY
TN
MS
AL
OK
AR
TX
LA
WA
MT
OR
ID
WY
NV
UT
CO
CA
AZ
NM

DOMESTIC PRODUCTION OF WOOD PULP – 1971	NEW ENGLAND	MID-ATLANTIC	E. NO. CENTRAL	W. NO. CENTRAL	Ⓐ SO. ATLANTIC	E. SO. CENTRAL	W. SO. CENTRAL	MOUNTAIN AND PACIFIC Ⓐ
47,743,000	2,796,000 TONS	1,481,000 TONS	3,290,000 TONS	980,000 TONS	14,981,000 TONS	7,880,000 TONS	7,299,000 TONS	9,037,000 TONS

IMPORTED WOOD PULP AND OTHER FIBROUS MATERIALS

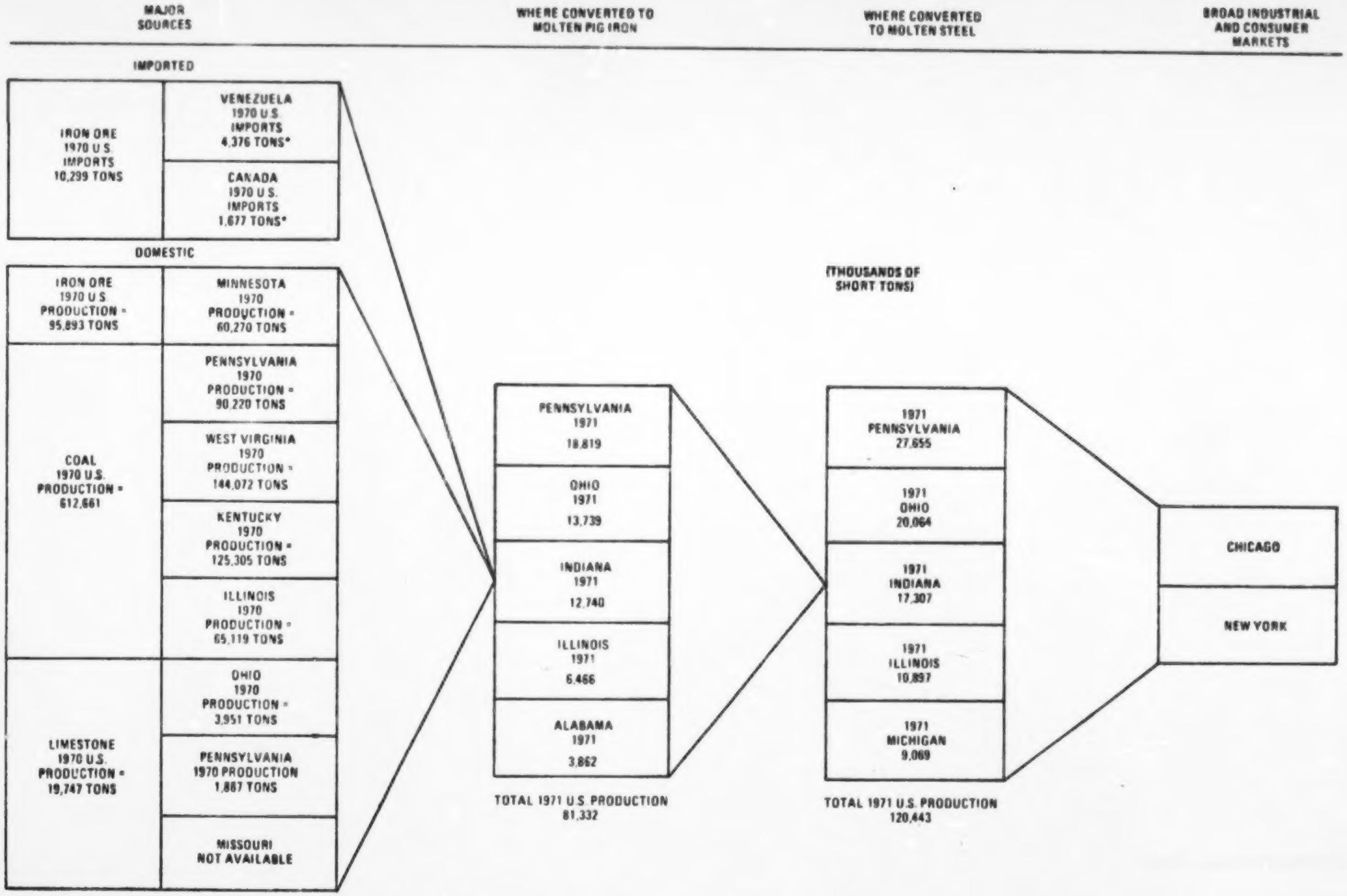
CANADA	–	153,953 TONS
OTHERS	–	138,345 TONS

Ⓐ PRINCIPAL PRODUCERS

* TIMBER IS CONVERTED TO WOOD PULP FROM WHICH PAPER IS MADE

SOURCE: MONTHLY STATISTICAL SUMMARIES
AMERICAN PAPER INSTITUTE

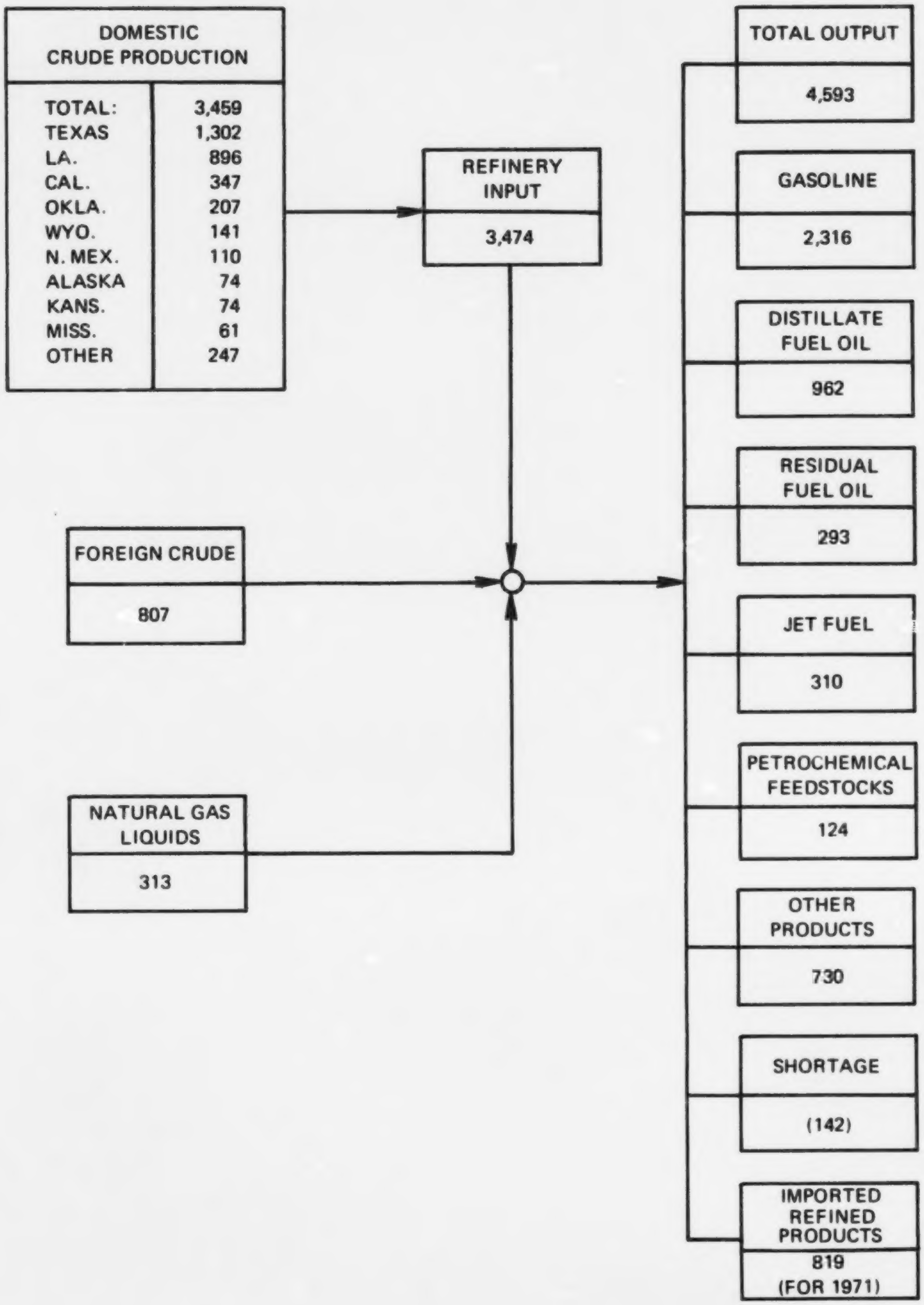
SOURCES OF IRON/STEEL FOR THE U. S. MARKET


MAJOR SOURCES
WHERE CONVERTED TO MOLTEN PIG IRON
WHERE CONVERTED TO MOLTEN STEEL
BROAD INDUSTRIAL AND CONSUMER MARKETS
IMPORTED
IRON ORE 1970 U.S. IMPORTS 10,299 TONS
VENEZUELA 1970 U.S. IMPORTS 4,376 TONS*
CANADA 1970 U.S. IMPORTS 1,677 TONS*
DOMESTIC
IRON ORE 1970 U.S. PRODUCTION = 95,893 TONS
MINNESOTA 1970 PRODUCTION = 60,270 TONS
COAL 1970 U.S. PRODUCTION = 612,661
PENNSYLVANIA 1970 PRODUCTION = 90,220 TONS
WEST VIRGINIA 1970 PRODUCTION = 144,072 TONS
KENTUCKY 1970 PRODUCTION = 125,305 TONS
ILLINOIS 1970 PRODUCTION = 65,119 TONS
LIMESTONE 1970 U.S. PRODUCTION = 19,747 TONS
OHIO 1970 PRODUCTION = 3,951 TONS
PENNSYLVANIA 1970 PRODUCTION 1,887 TONS
MISSOURI NOT AVAILABLE
PENNSYLVANIA 1971 18,819
OHIO 1971 13,739
INDIANA 1971 12,740
ILLINOIS 1971 6,466
ALABAMA 1971 3,862
TOTAL 1971 U.S. PRODUCTION 81,332
(THOUSANDS OF SHORT TONS)
1971 PENNSYLVANIA 27,655
1971 OHIO 20,064
1971 INDIANA 17,307
1971 ILLINOIS 10,897
1971 MICHIGAN 9,069
TOTAL 1971 U.S. PRODUCTION 120,443
CHICAGO
NEW YORK

*EXCLUDES IMPORTS USED FOR MAKING AGGLOMERATES

SOURCE: IRON AND STEEL, U.S. DEPT. OF INTERIOR.
MINERALS YEARBOOK, U.S. DEPT. OF INTERIOR, 1970.

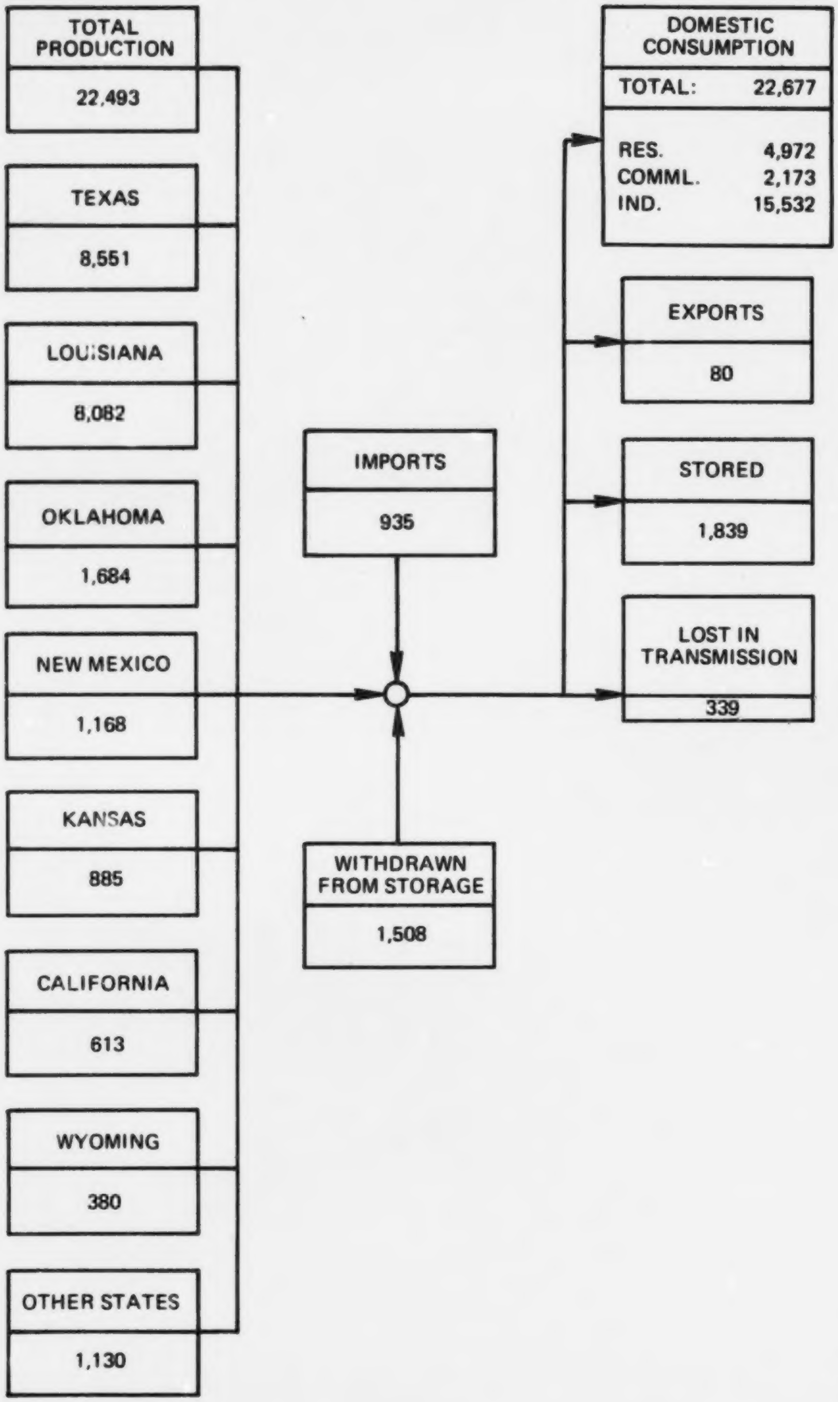
CRUDE PETROLEUM AND REFINING PRODUCTION – 1972 (MILLIONS OF BARRELS)



DOMESTIC CRUDE PRODUCTION	
TOTAL:	3,459
TEXAS	1,302
LA.	896
CAL.	347
OKLA.	207
WYO.	141
N. MEX.	110
ALASKA	74
KANS.	74
MISS.	61
OTHER	247

REFINERY INPUT
3,474
FOREIGN CRUDE
807
NATURAL GAS LIQUIDS
313
TOTAL OUTPUT
4,593
GASOLINE
2,316
DISTILLATE FUEL OIL
962
RESIDUAL FUEL OIL
293
JET FUEL
310
PETROCHEMICAL FEEDSTOCKS
124
OTHER PRODUCTS
730
SHORTAGE
(142)
IMPORTED REFINED PRODUCTS
819
(FOR 1971)

NATURAL GAS PRODUCTION AND DISPOSITION – 1971 (BILLIONS OF CUBIC FEET)


TOTAL PRODUCTION
22,493
TEXAS
8,551
LOUISIANA
8,082
OKLAHOMA
1,684
NEW MEXICO
1,168
KANSAS
885
CALIFORNIA
613
WYOMING
380
OTHER STATES
1,130
IMPORTS
935
WITHDRAWN FROM STORAGE
1,508
DOMESTIC CONSUMPTION
TOTAL: 22,677
RES. 4,972
COMML. 2,173
IND. 15,532
EXPORTS
80
STORED
1,839
LOST IN TRANSMISSION
339

COMBUSTIBLE WASTE AS AN ALTERNATIVE TO FOSSIL FUELS

This Appendix discusses the impact of tax benefits applicable to fossil fuels (petroleum, natural gas and coal) on their cost relative to the cost of combustible solid waste used as a fuel. It has been prepared as a supplement to the basic report contained in this volume at the request of the Office of Solid Waste Management.

1. FOSSIL FUEL COSTS

Exhibit C-I, following this page, shows estimated 1973 fossil fuel costs per million BTU's delivered to users. It should be noted that actual fuel costs can vary greatly, depending primarily on origin and sulphur content.

- The price of coal is sensitive to sulphur content as well as to the cost of mining with strip mined coal, the least expensive. Costs to users can vary from $0. 20 per million BTU's for accessible high sulphur coal to more than $0. 75 per million BTU's (mid-year 1973 prices) for low sulphur coal.
- The price of No. 6 fuel oil, as indicated on the Exhibit, is subject to wide variation depending on sulphur content and location of sale. As an example, No. 6 fuel oil in mid-1973 was selling in Chicago for up to $5. 88 per BBL and in Oklahoma for $2. 60 per BBL.

Because of the fuel price variability discussed above, it is apparent that any truly valid evaluation of the relative advantages of using combustible solid waste as an alternative to fossil fuels must be made on a case-by-case basis.

EXHIBIT C-I

FOSSIL FUEL PRICES PER MILLION BTU's (1973)

	Units	Price	BTU's Per Unit	Price per Million BTU
Natural Gas	MCF	$ 0.509	1,040,000	$0.489*
Bituminous Coal & Lignite	TON	12.24**	22,000,000	0.556
Fuel Oil (No. 6--National Average)	BBL	4.26***	5,800,000	0.734

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* Estimated average rates charged to industrial users for 1973, Source: "Analysis of the American Petroleum Institute - Foster Associates Study of the Impact of Deregulation on Natural Gas Prices" Congressional Research Service, 1973.
Note: Data on price per million BTU's for 1972 adjusted by +9% to reflect estimated 1973 prices.

** Source: Unpublished manuscript by Leonard W. Westerstrom of the Bureau of Mines. Estimated 1973 bituminous coal price of $8.16 per ton adjusted by +50% to reflect transportation costs to user.

*** Source: Federal Power Commission

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2. EXPECTED FOSSIL FUEL COST INCREASES

As is well known, the price of fossil fuels is increasing and is expected to continue to increase for the foreseeable future.

- Crude oil prices are expected to increase to \$7.00 - \$8.00 per BBL in 1974. Assuming that the price of No. 6 fuel oil (N. Y. Contract) averages out at \$0.75 per BBL above that of crude oil, costs to users could increase to as much as \$1.51 per million BTU's.
- If the well head price of natural gas is deregulated, then substantial gas price increases could occur, depending on the manner in which deregulation is applied and producer success in renegotiating prices on long term contracts.
- Coal prices, especially for low sulphur coal, may also be expected to increase as the fuel shortage continues.

Increases in the price of fossil fuels will, of course, tend to make combustible solid waste a more attractive alternative fuel source.

3. THE COST OF COMBUSTIBLE WASTE AS A FUEL

High and low estimates of the fuel costs of combustible solid waste are contained in Exhibit C-II, following this page. The estimates shown are based upon data contained in "Energy Recovery from Waste", published by the Environmental Protection Agency in 1973.

The variability in cost is a function of economies of scale and transportation cost differentials. The costs shown, at \$0.48 to \$1.39 per million BTU's, do not include the capital or operating costs for combustion equipment adapted to burning combustible solid waste.

EXHIBIT C-II

ESTIMATED COSTS OF COMBUSTIBLE WASTE USED AS A FUEL

	Low Cost	High Cost
Capital Costs	$0.80	$ 1.80
Operating Cost	3.50	6.00
Transportation Cost	0.50	6.00
Total Cost Per Ton	$4.80	$13.90
Cost per million BTU @ 10 million BTU/Ton	$0.48	$ 1.39

4. THE IMPACT OF TAX INCENTIVES ON FUEL COSTS

Exhibit C-III, following this page shows the incremental cost per BTU for fossil fuels if the applicable tax benefits detailed in the body of this report were repealed. The incremental cost shown is equal to the highest computed total tax benefit for each fuel converted to dollars per BTU on a pre-tax basis. Price increases required to recover income lost if the tax benefits were repealed would range from about 4% for natural gas to 15% for oil.

To develop any conclusions regarding the degree to which such an increase in fossil fuel costs would stimulate use of combustible waste, the relative cost of burning each type of fuel must be considered. Evaluation of such costs (equipment and operating costs) is beyond the scope of this effort. Given, however, that the cost of fossil fuels falls within the range of combustible waste costs, it may be stated that tax treatment equalization as summarized on Exhibit C-III could cause some marginal increase in the use of combustible waste over the long term.

Of much greater significance to the future of combustible waste, however, is the very rapid increase in the cost of fossil fuels, as well as their limited availability. Both high costs and lack of supply may provide a significant stimulus to increased combustible waste usage.

* * *

EXHIBIT C-III

THE IMPACT OF TAX BENEFITS ON FOSSIL FUEL COSTS

($ per million BTU's)

	Price	Incremental Costs if Tax Benefits Repealed	New Price
Natural Gas	$0.489	$0.020	$0.509
Coal	0.556	0.046	0.602
Fuel Oil	0.734	0.111	0.845